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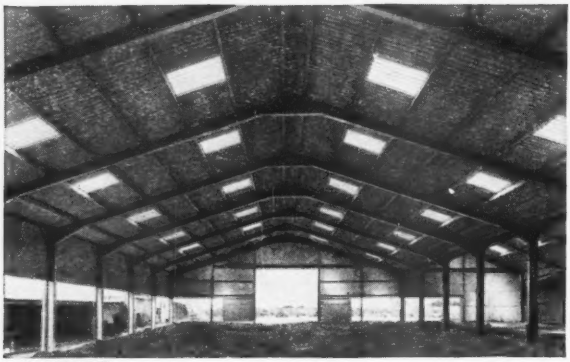

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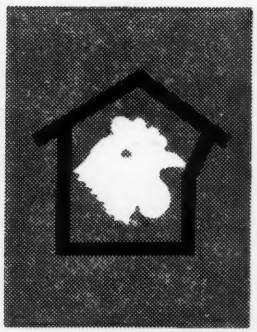

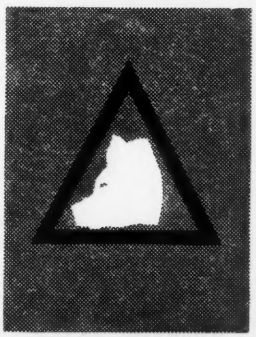

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John Walker, 36. Lives in Malvern. Senior ICI Rep, Worcs. London-born, got the farming bug as 1943 evacuee on 2 Hants. farms. Read Agriculture at Cambridge then farmed in Dorset for a year before joining ICI.

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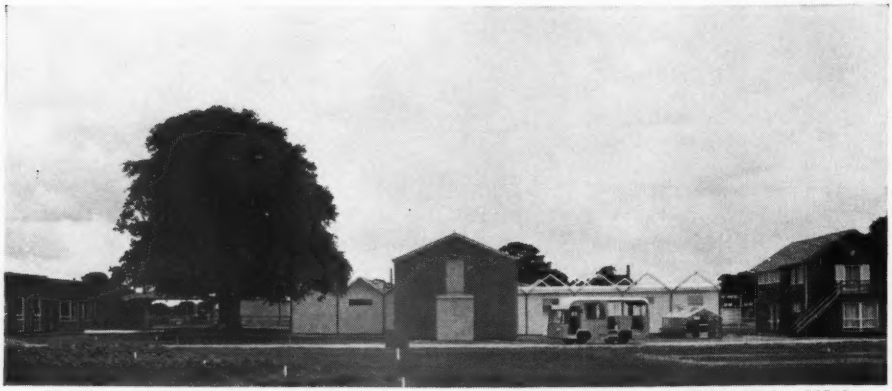

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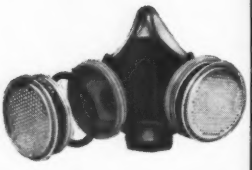

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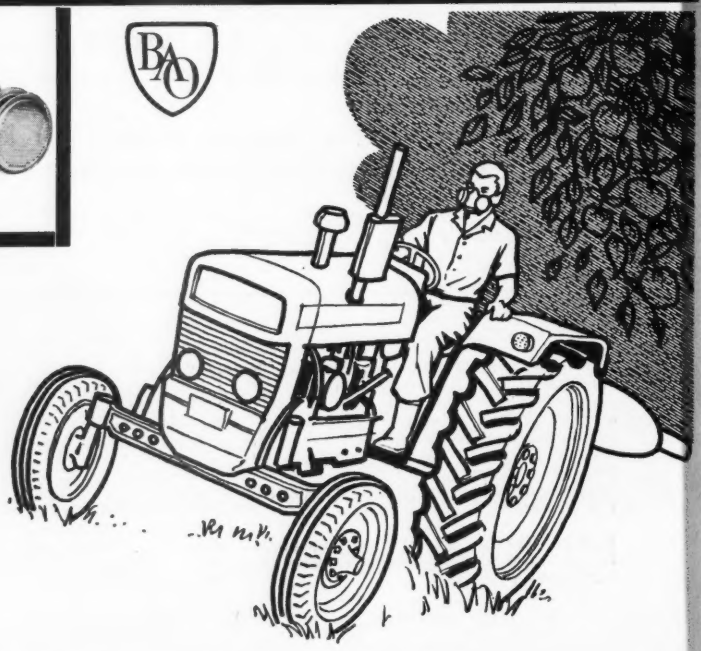


AGRICULTURE SEPTEMBER 1968

GUN SENSE

- **Care when shooting**
- **Care when carrying a gun**
- **Care and maintenance of the gun**

R. Hirons, a Divisional Safety Inspector of the Ministry of Agriculture, sets out the elementary rules for safe handling of guns

---

FARMERS, farm workers and others who shoot may suffer violent death or severe injury unless they take the greatest of care when using shot guns. This article sets out the elementary rules for safe handling of guns, and they should always be observed.

There is only one way to handle a gun and that is the *safe way*. Make a habit of using your gun in the manner described and you will safeguard not only yourself but others, and at the same time earn the respect of your colleagues in the shooting field. The first thing to do with a gun is to open it and ensure it is not loaded. On hammerless guns ensure that the safety catch is on *safe*. On some makes safety catches are automatically put on *safe* when the gun is opened but on others the safety catch has to be manually operated for both 'on' and 'off'. With a hammer gun make certain that the hammers are in the down position.

Check that the barrels are not obstructed and that they are not dented, badly pitted or rusted. Familiarize yourself with your gun by using a dummy cartridge to check the effort required to pull the triggers. *If the gun is in any way defective don't use it.*

In the shooting field

When shooting with others always have your gun 'broken' before the shoot starts, or between drives (see photograph on p. 408): it gives confidence. Never load your gun before taking up position for the drive or before commencing to 'walk up'. When inserting cartridges, make sure they go easily into the breach. Damp cartridges swell and although it may be possible to force them in they may be very difficult to get out again. Always use a proper cartridge extractor to remove jammed cartridges—it is the only safe way. Having loaded the gun, close it by raising the butt to the barrels and thereby keeping the barrels pointing downwards.

Keep the safety catch on *safe* until the moment you raise your gun to fire. Acquire the habit of pushing the catch forward with the thumb at the time of raising the gun to the shoulder. Should you not fire, the practice should be put into reverse, i.e., the thumb should return the catch to *safe* as the gun comes down. If possible learn to shoot 'with both eyes open'. Never shoot through a hedge, bush or where another gun, or people (especially children) might be.

When standing in line take your shot forward, in the open and at a safe angle. Under no circumstances must you 'cross the line' (see photograph on page 409).

Walking between drives

When your gun is loaded always carry it in a safe position. Should this be over your shoulder make certain that the muzzle points upwards and not horizontally or downwards, i.e., keep the trigger guard uppermost. It can be embarrassing for a colleague to say, 'I can see you are using number 5 shot today'—in other words, he can see down your gun barrels.

Obstacles

Before getting over a fence, hedge or stile, crossing a brook, or walking on steep banks, *always unload* your gun. It is not sufficient to open the gun and leave the cartridges in the breach. Neither is it safe if it is a hammer gun just to let the hammers down. *Unload.* A gun with faulty mechanism may go off if it is dropped, also hammers and triggers can be caught on twigs and nails and many shooters have lost their lives through accidents of this kind. (In January this year a young farm worker who said he was going to use his gun to scare pigeons off a field of wheat was found dead lying under a barbed wire fence. It appears that he had accidentally shot himself when climbing over or through the hedge). **Therefore always unload** (see photograph on front cover).

Always treat your gun as if it were loaded. Never point a gun at anyone—or indeed at anything you do not intend to kill. **Guns are made to kill and**

Always have your gun 'broken' before the shoot starts or between drives

When standing in line take your shot forward in the open at a safe angle

usually do. Never put a loaded gun into a car or vehicle (a young man aged 20 was found dead in January of this year at the rear of his parked van. It appeared that he had accidentally shot himself when removing his gun through the back door of the vehicle). In the interests of your own safety, that of others, and the gun itself, do not take it on a tractor, combine harvester or farm vehicle. Furthermore, never take a loaded gun into a house or other building and always keep your gun and cartridges in a safe place, out of reach of children.

Gun-care

A shot gun is a very valuable piece of precision equipment and the capital outlay involved makes it worthy of some care and maintenance. When you have finished with it, clean and oil it and put it safely away. It is a good practice to have your gun overhauled annually before the shooting season begins. Gun-makers and gunsmiths are skilled and competent people and you can rest assured that when your gun is returned it is as safe as it can be having regard to its age and general condition. All guns should be able to withstand the Proof Test and advice on this will be willingly given to you by your gunsmith. Incidentally, it is now unlawful to sell a gun which is 'out of proof', and to possess or use any shotgun a certificate must be obtained from the police. If your gun is a very old one with non-rebounding locks, be particularly careful. It is probably at least 90 years old and (with all due respect to sentiment) it may now be time for it to be 'hung on the wall'.

Lastly

Earn yourself a good name as a safe shot, even if you are not a good shot. Don't be impatient; relax and you will shoot better. Be proud of your gun, look after it and remember that it is a lethal weapon.

'Keep Farming Safe'

W. E. H. Fiddian *of the N.I.A.B. discusses the disease resistance qualities of many varieties of wheat. He asks 'What is wrong with wheat?'*

Wheat

WHEAT has been under rather a cloud in the last few years as a result of new races of yellow rust which attacked varieties which were resistant to the older races and therefore considered safe.

The position has improved. The resistance pattern of both existing and new varieties in trial is known; there are new varieties on the Recommended List which have adequate resistance to our known races, and a new nation-wide system for the earlier detection of new races was operated as from 1967 for the first time.

Wheat, both hard and soft, is one of the crops which shows the best potential for import saving, and the government has raised the subsidy in relation to barley. Clearly, the acreage should be as high as the disease hazard allows; take-all probably poses the more serious long-term limitation, and no hope of resistant varieties can be held out in the foreseeable future.

No guarantee can be given against yet further races of yellow rust, but three steps are being taken to minimize the consequences. Firstly, there is the earlier detection of new races already mentioned, so that earlier warning can be given. It is now almost certain that race 60 was present in the country in 1965, but was not recognized, although in this case the phenomenally quick spread of the race and the particular susceptibility of Rothwell Perdix made the problem especially difficult.

Secondly, breeders are now concentrating on the type of resistance known as non-specific or field resistance. At its best this gives adequate resistance, although not complete, to all existing races and with luck to any new races which may arise. Thirdly, the N.I.A.B. now seeks to know the genetic source of yellow rust resistance when considering a new variety for the List. If there is diversification of sources of resistance within the recommended varieties, a new yellow rust race is likely to attack fewer varieties.

Since Cappelle-Desprez was added to the Recommended List in 1953, it has enjoyed remarkable popularity. There have been varieties which are higher yielding, stiffer, earlier or of better grain quality, but none seemed to have the right combination of eyespot resistance, consistent performance and absence of any major defect. Champlein deserved a wider usage as a first wheat crop but lacked the insurance value of eyespot resistance. Maris Widgeon seemed on paper to have the attributes of Cappelle-Desprez, plus the bonus of grain quality, but has not achieved the same appeal.

Cappelle-Desprez and Champlein are, however, now border-line in their resistance to yellow rust. They are resistant to race 60, but susceptible to race 3/55, and in a rust year such as 1967 it was clear that some crops were infected to the extent that yield reduction could be expected. Hybrid 46 is similarly attacked by race 3/55, but Maris Widgeon and Elite Lepeuple have good field resistance.

It is thus intriguing to watch now the performance of two new recommended varieties which have a very good chance of becoming worthy successors to Cappelle-Desprez. They have eyespot resistance, have both given at least 10 per cent higher yield in trials, are earlier and stiffer, and have adequate resistance to present yellow rust races. These varieties are Joss Cambier from Cambier Frères in France and Maris Ranger from the Plant Breeding Institute, Cambridge. The former will be available in by far the greater quantity for the coming season.

Joss Cambier is slightly the earlier, shorter strawed and possible slightly stiffer. It is more susceptible to mildew than Cappelle-Desprez, and is not suitable for sowing after the end of January. Maris Ranger can be sown until the end of March and is being tested also as a spring wheat, a consequence of crossing Cappelle-Desprez with the spring wheat Peko. Otherwise the two varieties are rather similar. Neither has bread-making quality.

Certain other new winter wheats are still being tested but are likely to be on the market this autumn. Mildress is unusual in having high mildew resistance but is susceptible to eyespot. West Desprez has eyespot resistance and is slightly stiffer and of better bread-making quality than Cappelle-Desprez, and like Mildress has outyielded it in yellow rust years. Margin has inherited the manganese deficiency tolerance of its Hybrid 46 parent and has been slightly higher yielding, but is similarly susceptible to yellow rust race 3/55. Cama combines a yield higher than Cappelle-Desprez with eyespot resistance and stiffer straw and better yellow rust resistance, but like Joss Cambier it is susceptible to mildew.

The intensity of mildew infection this year is generally severe, both in wheat and barley. The results of N.I.A.B. trials with bad mildew attacks in previous years, suggest that the yields of varieties which are more susceptible than Cappelle-Desprez, but normally much higher yielding, may be dragged down to the level of Cappelle-Desprez under these conditions. This year's results will be of considerable significance for areas such as the West Midlands where mildew is bad in most years.

Curiously, yellow rust has been conspicuous by its absence this year except in Kent and in isolated fields elsewhere. This is in spite of the supposedly heavy carry-over of inoculum from last year and a fairly mild winter. We clearly do not understand the climatic factors responsible, but it is tempting to hope that the relatively good conditions last autumn and the awareness of the importance of stubble hygiene have played their part in keeping down yellow rust.

Various enterprising efforts are being made to offer specific contracts involving a premium for good bread-making quality based on protein content. Maris Widgeon and Elite Lepeuple have been specifically catered for, and it would seem that West Desprez might also be included in due course. It is most important that every effort should be made to raise the protein content by cultural methods of which the principal is the late spring application of nitrogen.

The cost of cereal seed cannot be ignored. It forms one of the higher variable costs in cereal growing, and when, as now seems to be the general rule, the seed cost of new varieties is at least twice that of established varieties, the profit from the new variety has to be closely considered. If a farmer grows a new variety of wheat for milling, using seed at 90*s.* cwt as compared with Cappelle Desprez at 45*s.* cwt he needs an extra 2·5 cwt per acre yield to cover his higher seed cost. However, most farmers would, and in fact should, use the expensive seed of the new varieties for further seed production producing Certified Seed or Multiplication Seed in the British Cereal Seed Scheme on contract to a seed merchant. In such cases the price received for their production should be well above the average 27*s.* 6*d.* per cwt, including subsidy.

All in all, the prospects for winter wheat seem brighter than they have been for some years.

The Beef Cattle Industry in Anglesey

J. R. M. Griffith

'Mon Mam Cymru' (Anglesey, the Mother of Wales), the county motto of Anglesey, is not a sentimental phrase coined by a medieval bard, but a poetic expression of the rather unique relationship that existed between Anglesey and other North Wales counties until fairly recent times.

The soft green contour of this island county offers a stark contrast to the bare rocky crags of the Caernarvonshire hills and in days when every locality had to be more or less self supporting it was natural that the people dwelling in these hills would look, perhaps enviously, but certainly with hope, towards the flat green fields of Anglesey for extra food supplies for the winter.

In times when the eating of meat, particularly fresh meat, was something of a luxury, wheat or any other cereal grain suitable for baking bread was regarded as the essential for survival, and for this reason the county motto is sometimes translated as 'Anglesey the Granary of Wales'.

In 1770 it was estimated that upwards of 90,000 bushels of grain were exported from the county and the numerous ruined windmills, which are still to be seen throughout the county, bear mute testimony to the fact that flour milling was an important industry on the island in the days before the vast prairies of the North American continent became the granary of Britain.

A beef cattle demonstration held in Anglesey during 1967

Development of cattle industry

The importance of grain as a crop overshadows the importance of cattle in all historical publications and it is difficult to obtain reliable information about the scope and extent of the cattle industry. The historical information in this article has been obtained from two interesting publications, namely, *A History of the Island of Mona* by Miss Angharad Llwyd of Caerwys (for which she received first prize at the Royal Beaumaris Eisteddfod in 1832), and *The Conway and Menai Ferries* by H. R. Davies.

The earliest reference to the cattle industry in both these publications is a quotation from Roberts *Map of Commerce* to the effect that in 1638, 3,000 head of cattle were exported from Anglesey annually. These cattle were presumably of the Welsh Black breed, Miss Llwyd states . . . 'but the chief trade is corn and cattle. The latter are well known and much appreciated by the natives of the Principality as *Cattel duon Mon* from their black colour'.

Transport

Regarding the transport of these cattle from the island, Davies in his book* quotes from a letter dated October, 1807, which gives an account of this operation . . . 'the people tie ropes to the horns of five or six bullocks at once, get into a boat and drag as hard as they can while others on the shore beat them cruelly to force them into the water. The people keep beating them all the way to encourage them to keep above the water and to swim which they do most awkwardly'. The currents of the Menai Straits are fierce and not to be trifled with, and the picture this conjures up is of excited men and boys beating panic-stricken cattle into the water whilst their companions in the boat try valiantly not only to row the boat, but also to prevent the cattle from tangling in the ropes and drowning. Transporting cattle in this way must have resulted in confusion and inevitably in the death of many cattle and it is, therefore, not surprising that the writer of the letter quoted by Davies inquired why suitable boats for transport of cattle

*Davies, H. R., of the Board of Celtic Studies at the University of Wales History and Law Series, *The Conway and the Menai Ferries*.

could not be provided at Bangor ferry as in other parts of the kingdom. The question evidently fell on deaf ears because the book reports that cattle continued to swim the Straits until the Menai Bridge was opened.

The charge for towing these cattle is given by one William Davies, ferryman in the Declaration in 1772, as the 'sum of two pence for horned cattle', and reference is also made in 1807 to the charge of two pence a head for towing the beasts over the Menai Straits.

The importance of the cattle trade in these early days is difficult to assess. Reference has already been made to the fact that 3,000 head a year were exported in 1638, but when Lewys Morris, one of the famous Morris brothers of Anglesey, was writing to a friend in 1740, he commented on this statement thus . . . 'but they (the farmers) have improved so much in husbandry since his time that they now amount to 15,000'. This latter figure is difficult to accept and possibly Mr. Morris, who was very loyal to his home county, may have exaggerated, because an account by a Mr. Provis of the cattle that passed over the Menai Bridge in the years 1830 and 1831 shows the figure of 5,760 head for 1830 and 5,704 for 1831. Despite this apparent decline in the cattle exports from 1740 to 1830, it appears fairly conclusive that by the middle of the eighteenth century more importance was being paid to the breeding and rearing of cattle by the Anglesey farmers, and that the cattle enterprises were beginning to challenge grain in importance as the main agricultural export of the county.

Breeding and rearing

At the present time the export of fat cattle accounts for an estimated 36 per cent of the gross agricultural output of the county and over the years two distinct patterns of production have emerged. The occupiers of large farms favour the purchasing of strong store beasts weighing between $7\frac{1}{2}$ and $8\frac{1}{2}$ cwt, whilst the occupiers of the smaller farms seem to prefer to carry out the whole process of rearing and fattening on their own farms. This system has much to commend it on farms of this type, as purchasing calves does not entail the same capital outlay as would be required to purchase the same number of store cattle; also the task of tending and rearing young calves, which often present labour difficulties on the large farms, is more easily overcome on a family unit.

Irrespective of whether the farmers purchase their stores or whether they rear them from calves, the system of fattening the animals is basically the same throughout the county.

A typical beef producing farm on Anglesey would be about 100–150 acres in area with a high proportion of the land as pasture with ryegrass/timothy/white clover swards predominating. Pastures that are reverting to indigenous or inferior grasses are ploughed up and put through a rotation of cereals and green crops before being reseeded again to pasture. The cereals thus grown, together with grass conserved as hay or silage, form the basis of the winter ration of the beef cattle. All fields have adequate boundaries and there is a supply of fresh water available to the stock at all times. The buildings on a typical beef farm vary from the new precast concrete type to the older open-fronted buildings and yards—the latter having been modified to make full use of labour-saving machinery.

On many farms, especially the ones handling a large number of cattle, the cattle crush and weighbridge is a prominent piece of equipment and

this is sited with care to allow the cattle to be handled quietly and with the minimum amount of fuss.

Feeding

Fattening the first bunch of cattle begins early in the year, when those of similar weights are housed together. In these sheds they are fed on hay and a cereal protein mixture and possibly some silage or roots. In early April the cattle are turned out to the pastures and the winter ration is gradually reduced, but hay is offered to them until their digestive systems have become accustomed to the change in diet. The cattle are weighed at regular intervals (say 14–21 days) and at this time the farmers assess their progress—the increase in weight since the last weighing, the condition of each animal's coat, even the way it stands and walks. All these facts are noted by the stockman, which helps him to decide his future grazing policy. He may decide to increase or decrease stock in a particular field, or introduce ewes to graze the pastures with the heifers.

After each weighing the farmer decides whether it is necessary to move the cattle to a fresh pasture. A good stockman seems to know instinctively when a pasture has gone stale and is no longer relished by cattle. In beef fattening it is not enough that cattle graze the field, they must be contented and increase their daily live weight satisfactorily. Under good management the cattle thrive on the lush pastures of the island and the first bunch are usually sold fat by mid-June. The farmers who purchase stores will probably purchase and fatten another two bunches of cattle by the end of the year, although the last one will probably be brought indoors in early November and fattening will be completed on a diet of hay and a cereal protein concentrate.

The smaller farmers who have reared their cattle from calves will also have some cattle to sell by early June, but because of labour limitations the whole production process on their farms is staggered, and where the larger farmers sell cattle in bunches of ten or more, the smaller farmers sell theirs in smaller lots of under half a dozen head at a time. The larger farmers, therefore, tend to sell their cattle direct to the large meat wholesalers, whilst the smaller farmers rely on the local auction markets, itinerant dealers or agents for large meat wholesalers as an outlet for their produce.

Trade in Irish store cattle

No article on the beef industry in Anglesey would be complete without some reference being made to the Irish store cattle trade which started with the development of Holyhead as a rail terminus for Ireland early in the present century. Farmers from Anglesey cross over to Ireland to purchase strong store cattle which are shipped to Holyhead and released to the farms after spending the required time in the cattle lairage at the port. The volume of trade has been fairly constant over the last few years, and about 12,000 Irish cattle are fattened annually on the Island. Although this trade is very important, particularly to the larger farms in Anglesey, Irish cattle do not account for the bulk of the beef produced. Taking the month of June when the grass is at its best, statistics for 1962* show that there were 14,332 cattle of two years old and over on the island, and of this number only 5,105

*Ministry of Agriculture, Fisheries and Food publication *Digest of Agricultural Statistics, 1962*, available from H.M. Stationery Office price 17*s*.

were from the Irish Republic. The greater part of the beef is produced from home-bred cattle, most of which is reared on the island.

Success

The success of this industry in Anglesey is based on two main factors, namely, the natural advantages of the island for growing grass in abundance, and the inherent skill of the farmers in the art of fattening cattle off grass. This skill has been absorbed by generations of young farmers in farm kitchens, at auction marts and in the open field, ever since the first fattener towed his unwilling beasts across the Menai Straits *en route* for the mainland markets many centuries ago. The possession of this skill is the main reason why some farmers are so much better than others at converting grass to beef.

The industry has seen great and fundamental changes in the intervening years but in essence it is the same, depending as it does on the skill and craftmanship of the farmer to ensure success. Machines are rapidly taking over the old rural industry skills but it is to be hoped that for many years to come the cattle industry of Anglesey will continue to flourish in the hands of men who, although they strive for maximum profit, are not deluded into thinking that maximum profit means maximum satisfaction in life.

This article has been contributed by **J. R. M. Griffith, B.Sc.**, who is a District Agricultural Adviser for the National Agricultural Advisory Service in Anglesey.

The authors, ***Tristram Beresford*** *and* ***David Wallace,*** *discuss inter-farm comparisons between France and England*

Inter-Farm Comparisons

It was the French who made the first approach. Their idea was that we set up a technical study group (C.E.T.A.) for inter-farm comparisons. They wanted it *ad hoc*, about six-a-side, with a minimum of staff work and as much time as possible for cards-on-the-table discussion. The participants should be large farmers, articulate about management problems. In the interests of scientific truth, it might (they said) be advisable to co-opt an economist each. What did we think? We thought well of the idea and the first exchanges took place at St. John's College, Cambridge, in June 1967, Sir Joseph Hutchinson acting as host. A return visit to France was made in May this year.

Agricultural backgrounds

The background to this exchange of visits is interesting. French agriculture, like other agricultures in EEC, is structually less advanced than ours, being still overweighted with peasant holdings (see Table 1). Whereas our large holdings produce by value 50 per cent of annual gross output, occupy 40 per cent of the area of crops and grass, and employ 55 per cent of the labour force, in France, holdings larger than 250 acres are a tiny minority. In 1963, according to Chombart de Lauwe, there were only 23,000 of them and they contributed less than 10 per cent to total agricultural output. Division of interest between large and small is, therefore, much greater in France, and so are the tensions between them. Indeed, the Société des Agriculteurs de France, which is the 'big man's shop', is viewed with some reserve by the French Federation of Farmers' Unions, whereas in Britain the Price Review is every farmer's umbrella, and the committee rooms at Agriculture House are open to all. For these reasons the French envy and respect the way we run things. Grass, of course, is always greener across the fence—or across the Channel—but nevertheless, the French are probably right that in management expertise on larger holdings the Anglo-Saxons are the most experienced farmers in Western Europe.

Table 1 STRUCTURE OF FRENCH AGRICULTURE (1963)

Category	Approx. number '000	Average acreage crops and grass[1]	Estimated gross output/ holding[2] £	% of gross output of French agriculture	Labour units employed[3]
1. Commercial holdings of which	1,497	54	1,700	96·9	—
(i) Large holdings over 250 acres	23	403	12,500	8·7	5·0
(ii) Medium holdings 125–250 acres	83	165	5,250	13·5	3·2
(iii) Small holdings 50–125 acres	380	75	2,700	31·0	2·4
(iv) Small holdings under 50 acres	844	25	1,000	25·1	1·5
(v) Specialist holdings	167	21	3,700	18·6	3·0
2. Very small holdings	403	10	250	3·1	0·3
3. Statistically insignificant holdings	not available	not available	not available	—	not available
TOTAL	1,900				

[1]Agricultural area of France is 80–85 m. acres, mountain, hill and rough grazings excluded.
[2]At 1963 parity: £ = NF 13·5.
[3]Including occupier.
Source E.N.S.A., Grignon, S. et O.

Big-scale farming

Much of the big-scale farming in France is in the north-east. In the five departments—Aisne, Oise, Somme, Seine et Marne, Seine et Oise—70 per cent or more of the holdings are tenanted (45 per cent in France as a whole). Good arable or grassland is worth £300–£400* an acre; more if it is close to Paris. About 10 per cent of the holdings are larger than 250 acres; 17 per cent in the Seine et Marne. Because of land famine there are nominal restrictions on the size of holdings (Loi du 8 Août 1962), designed to prevent fragmentation at one end of the scale and accumulation at the other, although in practice, the law is seldom enforced. It is criticized on two grounds, firstly that it exists at all and, secondly, that it is not applied.

* At post-devaluation exchange rate of NF 11.5 to the £

Labour and results

By U.K. standards, the farms in these departments still employ a lot of labour: two or three men per 100 acres of arable land is not uncommon. Wages are high. A tractor driver, working 2,600–2,800 hours, will earn £800–1,000 a year, about a quarter of which is social security and other charges paid by the employer. Here and there, as on the broad acres of the Subtil brothers west of Paris—a family partnership with 4,000 acres reclaimed from heath and scrub, specializing in beet, cereals, rape-seed and lucerne for cubing—the work force is down to, and management up to, the finest functional standards in East Anglia. But the Subtils are exceptional and so too are the opportunities that exist for land reclamation on this, or any scale in France today. More typical was M. Letrillard, farming 750 acres in the Aisne, with 12–15 employees. His yield of wheat, according to the Office Central de Comptabilité in Soissons, was above the 35 cwt/acre five-year average for the district. But his margin between receipts and total costs was only £10 an acre, equivalent to 5 or 6 cwt of grain. A heavyweight beef enterprise, also on this farm, was quite well done, but in spite of a live-weight price of 280*s*. a cwt, success depended on M. Letrillard senior who, with an eye for stock, bought the stores. It seems that whatever the end price for beef, the cost structure will adjust to it. To get more red meat, we were told, EEC will have to increase the beef price relative to the price of cereals. The argument is familiar. In advanced economies beef is caviare.

Working capital and taxation

On the large-cropping farms in this part of France, working capital per acre is about double what it is here (Table 2). Main differences arise on items 1, 2, 4 and 7 (Trade Investments, Implements and Equipment, Growing Crops and Current Assets). In Britain, not dissimilar farms, with 50 per cent under cereals, will have next to nothing in trade investments, and maybe only half the capital tied up in crops, implements, and current assets. To some extent, this is a reflection of our lower prices (except for beet and potatoes). More particularly, it is a consequence of our lower factor costs. Although agricultural wages are as high, or almost as high, as they are in France, our direct labour costs per unit of output are much lower. Our fertilizer prices, after subsidy, are two-thirds of French prices and, except for fuel, so are our machinery expenses. The catalogue price of a medium-powered tractor, for example, is around £900 here, as against £1,685 in France, and of a 14 ft combine £3,400 as against £5,000. The reason for this is the French addiction to indirect taxation. In Latin countries it is simpler and surer to raise taxes on the costs of production than on its profits. Tax gathering is cheaper, too.

Table 2 **WORKING CAPITAL**

£ per acre
(based on average of 40 mixed farm enterprises in Picardy and Ile de France, June 1966)
Average size of holding: 600 acres
Average area under sugar-beet, potatoes, peas and vegetables, 35–45% of the holding

	£
Trade investments*	14
Implements and equipment	35
Livestock	9
Growing crops	37
UMVs	2
Sundry stores	2
Current assets	21
Total working capital per acre	120

*Mainly shareholding in agricultural co-operatives.
Source: E.N.S.A., Grignon, S. et O.

French farmers therefore are still, for the time being, on Schedule B. Profits are 'assessed', according to soil type, by a departmental commission. If the farmer has had a bad year or thinks he has been over-assessed, it is up to him to appeal and produce his accounts—if he has any. If he has had a good year, or is satisfied with his assessment, he lies low. This means that the indifferent operator pays more tax in France than he would here. Equally, it means that the successful operator pays less. The Frenchman still has the incentive to excel.

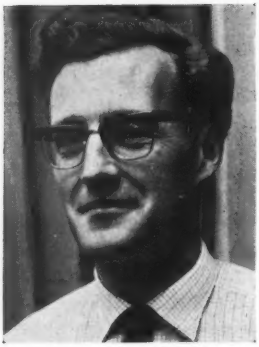
The French are fortunate also in their sources of capital. For land purchase they can borrow at 3 per cent, for up to 30 years, to a limit of £13,000. The rate for working capital is 5 per cent for two to fifteen years. They get these terms from their Co-operative Land Banks. Credit from other banks is at normal rates, with no limit. These details were given to us in May. No doubt money has since become dearer.

Résumé

To sum up, there seems to be little difference in productive efficiency between the best French farming and the best of ours. But in organization and management we are in the lead. There is no equivalent in France to our Agricultural Economics Service—the nearest is the Office de Comptabilité in Soissons. Nor is there an equivalent to our National Agricultural Advisory Service. The French spend only a fraction of what we spend on agricultural research, education and extension, and they are only just beginning to think seriously about resource management and, even then, only the larger farmers. For this reason what our hosts wished to learn about were our costing, budgeting and decision-making techniques and, after that, our attitude to labour relations; for example, did we use incentive schemes and what were our productivity yardsticks. In short, how did we set about enlarging the area of common interest between employer and employees? Discussion on this was illuminating. It revealed a real difference in outlook and a contrast in national temperament. On the one hand the Anglo-Saxons, pragmatic, empirical, essentially non-intellectual in approach doing what we do largely by feel, having learnt it along the hedgerows of experience and, on the other, the French, analytical, formula-seeking, probing, epigrammatic. 'Economic growth', said one of our hosts, Alain Delaunoy, 'must be qualitative as well as quantitative. But we shall not improve the quality of life unless, as employers, we respect and develop the creative faculty in man—not in individuals only, but in all men'. It sounded a bit strange to English ears, especially to farmers' ears. But after recent events in France do we have the right to smile?

References:

1. Société des Agriculteurs de France, 8 rue d'Athènes, PARIS 9e.
   (President: M. AUBE)
2. Centre des chefs d'enterprises agricoles (CENAG), 8 rue d'Athènes, PARIS 9e.
   (President: M. DELAUNOY)
3. Office Central de Comptabilité Agricole, 22 Avenue de Chateau Thierry, SOISSONS
   (Director: M. DELATTRE)
4. Ecole Nationale Supérieure Agronomique GRIGNON, Seine-et-Oise.
   (Professor Chombart de Lauwe)
5. La Documentation Francaise, 29-31 quai Voltaire, PARIS 9e.–for publications by SAFER, SCAFR, INRA, etc.



Co-operation—

Vegetable Production and Marketing

Peter Howarth

In the early days, before the formation of East Lincolnshire Growers Ltd., even the larger vegetable producers were finding it difficult to provide a continuity of supply of well-presented and graded produce, demanded by the changing market outlet. Coupled with this was a tremendous scope for improvement both in production methods and presentation. The growers too needed an assured market operated by an efficient sales organization.

ELGRO originated from meetings of a few progressive-minded growers, the N.A.A.S. horticultural adviser and the Agricultural Co-operative Association Ltd. during the winter of 1962–63. It became obvious at these discussions that most growers had to consider a change in their production and selling policies to compete favourably in the changing agricultural climate. In August of 1963, some 29 members attended a meeting when a sponsor committee of seven was elected to look into the feasibility of a production and marketing group for cauliflowers, Brussels sprouts, cabbage and potatoes.

The original sponsors of the company all farmed, within a ten mile semi-circular radius of Boston, on acreages ranging from 20 to 2,000.

Membership came from interested growers attached to local discussion groups, who knew each other intimately on farming as well as on a social basis. It was agreed that care in selection of members was essential but a most difficult and thankless task to perform. The structure of the organization was so constituted that if mistakes had been made a non-co-operator could be expelled. Member involvment occurred at an early stage when various sub-committee were appointed to investigate the various disciplines, e.g., buildings, finance, potatoes and other vegetables, and reported regularly through their chairman to the main steering committee. Since the formation of the group, a more sophisticated form of member participation has been developed to relieve the board of directors of many policy-forming meetings, and to stimulate member interest.

During this period grant-aided feasibility studies were in progress to establish the worthiness of the scheme, in particular the centralization of packing and grading, which was abandoned due to the uncertain future of the marketing requirement. Pre-packing was on the increase but a greater

demand from the market outlets was for continuity of supply of a good commercial grade. This demand was met by farm packing and grading with a low capital requirement. In all, at least two years went by before trading began; to the observer this would seem too long, but none will doubt the success of the project and that the original investigations were fair and worthwhile. Embryo groups could well take notice of this example.

Objectives

It will be realized that such a project could not get under way without setting down clearly and concisely the objectives so that satisfactory results could be achieved.

1. To co-ordinate the growing, grading and marketing of horticultural produce to ensure where possible a continuity of supply to market outlets, thereby resulting in the best possible return to growers on an equitable basis.
2. To provide the consumer with a better quality and better produced article.
3. To give to grower members the advantage of a specialized marketing service acting on their behalf on a co-operative basis.
4. To seek market outlets, and supply the kind and quality of produce demanded.
5. To establish and enforce standards of grading and packing.
6. To agree a brand name or mark readily identifiable by the trade and the consumer.
7. To employ a technical officer to ensure maximum yield of high-quality produce resulting from a planned production programme based on up-to-date techniques and scientific knowledge.
8. To engage qualified staff to implement the recommended scheme.
9. To form a limited company with appropriate articles of association supported by an agreed form of marketing agreement.

It will be seen that a large amount of information was required before commencing operations; acreages, yields, unit throughput, that is, bags or crates per acre, and an assessment of the value of this produce taken from the grower's previous three years returns. A realistic appraisal of each grower and his farm must be made to achieve accuracy for budgeting and accountancy purposes in the company formation. This led on to a point in time when grower and adviser realized their shortcomings and invited legal, accountancy and other specialist advice on company structure and legal agreements.

Plant raising showing the first stages of planned continuity and quality control. Potted plants on right and broadcast on left

Advisory sub-committees

Four such member committees, i.e., finance and general purpose; vegetable; potato and building, were set up in the early days each headed by a chairman who was a member of the Board. The members themselves had a specific interest in a particular commodity and had certain aptitudes of business formation. Each sub-committee had its own terms of reference. From the outset the company has fostered grower involvement, thus each member has felt in some way that he has taken part in the formation and running of his own company.

On the production side, the N.A.A.S. were used in the planning of plant raising, planting and production techniques generally and varieties. When the technical adviser was appointed a close liaison continued with the horticultural advisers and the horticultural experimental stations. In fact, liaison has been a feature in the progress of ELGRO over the years, thus building up a strong confidence in the company and in the individual and, to say the least, in industry as a whole.

Capital requirement

From the outset it was agreed that the minimum of capital expenditure should be incurred. The all important factor was to develop and operate production/marketing on a co-operative basis and when the principle was proven then expand wisely on experience and knowledge. All that was required to operate initially was a room, a desk, a telephone and capable people to manage the organization. All members were growers and took out an interest-free £10 share to join 'The Club'. The group was registered as a private company, under the Companies Act 1948 and the maximum number of members was 50. To ensure that working capital would be realized during the development period a £10 qualification loan was instituted per contracted acre. Since a low capital input was at first envisaged, only £3 of this loan per acre was called upon, and moneys for expansion and development accrued from the surpluses from the 4*d.* per unit service charge, after running expenses had been deducted. The company did not rely on grant-aid for the setting-up and running of the business, it was in fact budgeted to stand on its own feet from the beginning with grant-aid as a form of insurance.

Loyalty and discipline

The members of the organization took some part in preparing marketing agreements and the rules of good conduct. If the members themselves do just this with the maximum amount of agreement then the question as to 'who wields the big stick?' is squashed outright. This is the essence of good co-operation. To ensure their loyalty, members signed a contractual agreement for fifteen years with a break clause every three years after the initial three-year period. The agreement may be broken either way provided one year's notice is received.

On acreage, a grower under 50 acres will contract the whole of his acreage of specified crops but an over 50 acre farmer contracts for a minimum of 50 acres. No designated produce must be sold outside this agreement except by permission of the company. Members are encouraged to contract 100 per cent of their produce through the company, which has aimed, right from the start, for a 100 per cent committal all round.

Payments to members

Growers tend to look at the revenue end first, no doubt understandably, but to arrive at a maximum return they must discipline themselves to improve their production methods and grading to obtain a high percentage of their production in the upper grades which will receive the higher pooled price for that period and grade. This was the only equitable way on which to base payments to individuals. Pooled prices and grading standards of this nature were an incentive for the improvement and maintenance of a high standard of production and presentation.

Grades are determined according to the discretion of the technical manager and the crop, thus setting the level of pools for that period. All produce is sold in non-returnable containers, allowing for flexibility. All revenue for produce sold, has deducted from it, the 4*d.* unit charge, the remainder is then channelled to the appropriate pool, for distribution to the grower within 14 days of the sale taking place.

The management developed a growers' incentive league table. This showed in code each member's production and realization prices for a particular period. It was not long before growers at the lower end of the scale were inquiring into their fellow members' production methods.

Grades

Before statutory grades were evolved the company laid down its own standards, particularly for cauliflowers, as it was thought that the market was still under-supplied with good, well-graded produce. As well as attending to the grade standards there was a continuous search for better packing materials, in fact, trials were conducted using cardboard 'face packs' of six curds. These have shown a premium that demanded a high standard product. Grading gave the opportunity for setting up a brand name, recognizable for a high standard and count, most important when selling on description to firm outlets.

It was found over the years that the person cutting cauliflowers and/or dressing the potato crop was the key to successful grading. A crop well grown requires a keen staff to present it to advantage and all concerned, including the grower, must be aware that sub-standard produce should be kept off the market. Growers now realize that the brand name ELGRO is, in fact, their own name.

Staffing

The job of 'when' and 'who' to appoint and to take care of one's affairs was, and still is, a most difficult problem to resolve. Original budgeting will determine how much a company can afford to pay out in salaries and expenses. To decide whether a sales manager or the technical manager should come first depends on availability of money, scale of operations and calibre of the growers.

It was felt that, ELGRO, with its original relatively large acreage of some 2,000 and a throughput of about one million units, should appoint, simultaneously, sales and technical management to get the operation off the ground. Time proved that this decision was right, since a high degree of skill was required in planning and regulating the production which was determined by the sales management, according to the market requirements.

Care was taken in selecting managers, and advertisements were placed in the national papers to cast the net as wide as possible, remembering that the men required were not unemployed. The post had to be attractive and a challenge to get the right man. Local men, familiar to all, may not prove to be a sound proposition, particularly when it comes to enforcing standards and making decisions, some of which may not be popular with some members. In all, men of high calibre, technical and business ability, leadership and sincerity were most suitable in this field. As the group developed over the years and acreage grew from 2,000 to 4,000 it was found necessary to appoint additional crop and sales specialists to cope with the greater demand for technical and sales guidance. Staff management has not stopped at the company's doorstep; on the contrary, the farm managers and foremen are called together regularly to discuss production techniques in relation to company policy.

Group production and marketing

Measuring the financial worthiness is not easy, since there is little opportunity to compare results of an operative group with any other similar organization. It is quite evident from the members that benefits from production, planned cropping, improved techniques, yields and in turn, returns per acre, are far above previous years, i.e., before they joined the group. The organized sales department has readily moved the produce due to the regularity and consistency of standard. Generally, an all-round gain from the venture has resulted.

The turnover in 1966 was over £500,000 with a unit throughput of one-and-a-half million per year; a year later the turnover had doubled with an increase of units to one-and-three-quarter million, a unit being a crate of cauliflower, or net of sprouts or 56 lb bag of potatoes. Due to an increased acreage in 1968 these figures will rise once again, but it is interesting to note that the 4*d.* unit charge has (a) covered increased staffing and administration; (b) provided a suite of modern offices at Kirton without drawing further on the original qualification loan—in other words, the business was planned to be viable and its rapid development has maintained this position; (c) built up a modest capital reserve due to the mutuality clause in the constitution.

What of the future?

The rules of discipline have been seen to work and unsuitable members have been replaced by others who seek an advancement in their farming business. It would appear that the board operates on a consolidation but progressive programme, no canvassing for new members but the exploitation of land in the hands of existing members. In saying this the group are aware of the necessity to liaise closely with other groups on a commodity basis so that the more good groups developed, the stronger will the place be for each of the commodities on the market.

Consideration, after four years, is being given to some form of centralized packing station in view of the fact that a demand is apparent from the large retail outlets for semi-processed and packed vegetables.

In summing up, it is necessary to repeat a few of the outstanding principles for consideration:

1. Choice of membership.
2. Care and time in planning to establish a worthwhile scheme.
3. To prove the idea and invest capital accordingly, e.g., palatial buildings at the outset do not spell success.
4. Selection and appointment of suitable staff as the business grows.
5. The group must demonstrate to its members the benefits of planned production and sales.
6. Member involvement is a stimulus for the building of a healthy company.
7. When successful, the members will have more time for their specialized farming. The members will refer to their own company as 'Us' and not 'They'.

Acknowledgment is due to R. W. Sherwood the Managing Director of E.L.G.R.O. for his guidance on this article.

Peter Howarth, N.D.H., is the Regional Co-operation Adviser in Horticulture for the Eastern Region of N.A.A.S. and is stationed at Cambridge. He was previously Horticultural Adviser in Worcestershire and Lincs (Holland), where he specialized in vegetable production. Mr. Howarth was one of the original initiators of E.L.G.R.O. and, until recently, worked with it during its development.

The British Occupational Hygiene Society

Twenty-Third Conference

Health Hazards in Agriculture

Tuesday and Wednesday, 17th and 18th September, 1968

University of Cambridge

This conference will be held in Lecture Theatre No. 1, University Engineering Department, Trumpington Street, Cambridge, on 17th and 18th September, 1968. Overnight accommodation for 16th and 17th September will be available at Christ's College, St. Andrew's Street.

On 17th September, papers will be presented on various hazards and diseases associated with agriculture, and on the 18th, arrangements have been made to visit research centres and other places of interest. The proceedings will be published in the 'Annals of Occupational Hygiene' (Pergamon Press).

A conference dinner (dress informal) will be held at Christ's College on 17th September.

The conference is open to all members and industrial members of the Society. Non-members may attend on payment of a registration fee of two guineas.

Anyone wishing to attend is asked to return the registration form as soon as possible to Mr. D. C. Murphy, Hon. Scientific Secretary, British Occupational Hygiene Society, c/o Medical Department, Esso Refinery, Fawley, Southampton.

Feeding Ground Straw to Cattle

D. A. Perks, *Gleadthorpe Experimental Husbandry Farm*

GLEADTHORPE E.H.F. is a sand land arable farm which is run on a rotation that includes a two-year ley break utilized by cattle on the '18-month beef' system. In a continuing effort to raise the output of this grassland we are interested in the possibility of raising stocking rates to use more of the available herbage as grazing. This would have the advantage of reducing the need for silage-making which always clashes with beet hoeing and irrigation, but would mean a change in winter feeding policy for at least some of the cattle to a ration based on arable by-products rather than silage. On cereal growing farms by far the most plentiful of these by-products is usually straw. Recently much attention has been focussed on the feeding of dairy cows in winter on straw and concentrate rations, a system which Boxworth E.H.F. has recently summarized as being more a way of reducing the acreage devoted to cows than a cheap method of producing winter milk. Can straw be used in the winter fattening ration of beef cattle similarly to reduce dependence on grass products?

Cattle rations in which the sole source of roughage is straw are usually designed for animals from whom only limited liveweight gains are required, but the results of research work started at Nottingham University in 1963 suggest that some reappraisal of the value of straw is possible. They were investigating the influence of varying proportions of energy to protein on the growth rate and carcass quality of Friesian steers. In these experiments finely ground barley straw was used as a convenient method of varying the energy/protein ratio and roughage content of a pelleted intensive-fattening ration based on maize. The interesting point that emerged was that compared with all-concentrate diets, rations containing up to 30 per cent by weight of ground straw gave only slightly inferior liveweight gains when fed to Friesian steer cattle between 500 lb and 800 lb live weight. This suggested that barley straw milled through a $\frac{1}{8}$ in. screen and then pelleted with the cereal and other components of the ration had a feeding value considerably better than that normally associated with either chaffed or long barley straw.

The reasons for this improved feeding value following grinding were not fully understood and, while research work continued to establish the principles involved, Gleadthorpe was encouraged to test the reaction of a group of yard fed bullocks to the ground straw ration.

The tests

In mid-November, 1965, the 14 yearling Friesian steers remaining after other experiments had been stocked were yarded off grass and introduced to the ground straw ration. This comprised:

lb	
1,310	rolled barley
650	ground barley straw
168	soya bean meal
56	white fish meal
56	vitamin and mineral supplement
2,240	

The level of feeding was gradually increased during the first fortnight until the animals were taking the ration to appetite in addition to 5 lb/head/day of silage.

The original workers had fed the ration cubed, but it proved impossible to mix it mechanically with the equipment available at Gleadthorpe, and it was not intended to pellet the ration as it was felt to be important to establish whether this was necessary. The problem of mixing arose from the bulk and the poor flow characteristics of the straw which had been ground through a $\frac{3}{16}$ in. screen, and the intense dust created whenever it was moved. The difficulty was eventually overcome by placing the ground straw straight into the manger with the other ingredients on top of it and roughly mixing them together by hand. In spite of the extremely dry and dusty nature of the ration fed in this manner the animals ate heartily and at one time shortly before the first were sold they were consuming 28 lb/head/day.

The initial live weights of the animals, a mixed bunch, ranged from 584 to 1,088 lb. They were drawn for slaughter as they became fit and eight of them were sold fat during the experimental period, which lasted 98 days. Average liveweight gain was 2·5 lb per day for a consumption of 25 lb of the ration per day.

The following winter a second observation study was conducted using the same ration. A new mixer had been installed which enabled the whole ration to be properly mixed and it was fed *ad lib.* from hoppers. The trial period was 105 days from mid-February during which time the animals gained 2·4 lb per day and consumed 26 lb per day of the ground straw ration. Their mean live weight ranged from 624 to 1,134 lb initially and all but two of the 16 animals were sold fat during the trial period.

The results

Results from the two years were remarkably consistent and although the conversion ratio was wider, as would be expected with a feed of lower energy concentration, liveweight gain was similar to that of the most nearly comparable animals concurrently on a normal barley-beef diet elsewhere on the farm. Total food intake per day was 2–3 lb higher with the ground straw ration but, of this, 8 lb was ground straw. In other words, 18 lb of barley, etc., plus 8 lb ground straw, gave the same liveweight gain as 23 lb of a conventional barley beef ration, suggesting that the ground barley straw had rather more than half the feeding value of the barley it replaced.

At this point it was felt that results had confirmed, as far as facilities had permitted, the improved feeding value of ground as compared with long barley straw, and that more animals should be devoted to a critical examination of ground barley straw as a component of fattening rations for cattle. Fortunately, this coincided with the completion of two series of cattle experiments on the farm so that those animals became available, and further encouraging results were by then forthcoming from Nottingham University. Thus, in November, 1967, four matched groups each of ten yearling Friesian steers, weighing 7¼ cwt were yarded off grass and allocated to experimental treatment.

One group was fed, as before, on a ration containing 30 per cent ground barley straw, two groups on a ration containing 50 per cent ground straw, and the last group on a ration containing 30 per cent long straw. The latter group were fed an estimated quantity of the concentrate plus long straw to appetite, and the concentrate was adjusted weekly in arrears to achieve the desired proportion of concentrate to straw. Mechanical mixing of the 50 per cent ground straw ration proved impossible, so that for both 30 per cent and 50 per cent rations it was necessary to revert to the earlier practice of weighing the ground straw separately from the other constituents, which were mixed in the normal way, and combining the two parts of the ration by hand in the trough. The formulation of the rations was modified this year, the fish meal and soya bean meal used previously being replaced by urea at levels calculated to give all rations the same crude protein content. It should also be recorded that in every year the barley used in the production of the ground straw rations was moist barley which had been stored in a sealed silo at moisture contents varying at different times between 18 and 23 per cent.

In the 91-day experimental period, the group on 30 per cent ground straw gained 2¼ lb per day and consumed 25 lb of the ration, of which 8 lb was ground straw. The groups on 50 per cent ground straw barely gained 1¾ lb per day and consumed 21 lb of the ration per day. The other group also gained 1¾ lb per day for a consumption of 14 lb of concentrate and 7 lb long straw per head per day.

The author handling the ration containing 30% (by weight) of ground straw

Compared with the ration containing 30 per cent long straw there has been an improved food intake on the 30 per cent ground straw ration and a small improvement in the utilization of the straw. In terms of animal performance 10½ lb of barley mix and 10½ lb of ground straw were almost equivalent to 14 lb of barley mix and 7 lb of long straw.

It was anticipated that animals on the 50 per cent ground straw ration might not fatten readily, and following the completion of the experimental period one of the groups which had been on this ration was changed on to an all-concentrate diet. All the other groups were changed on to the 30 per cent ground straw ration and animals were drawn for slaughter from all groups as they became fit.

The cattle which had been on the 30 per cent long straw ration increased both their intake and performance on the 30 per cent ground straw ration, gaining 2 lb per head per day. The two 50 per cent ground straw groups, one now on 30 per cent ground straw and the other on the all-concentrate diet, both increased their rate of liveweight gain to just over 2 lb per head per day, but the all-concentrate group were fit for slaughter slightly earlier on average and ate 22 lb concentrate per day, whereas the 30 per cent ground straw group ate 16 lb concentrate and 7 lb ground straw per day.

The group, which remained unchanged on 30 per cent ground straw throughout the winter, were disappointing this year. Although their intake of the ration has remained steady at around 25 lb per day, poor liveweight gains in the latter part of the winter have pulled their average down to just 2 lb per day. The reason for this is not clear, and it is perhaps slightly ominous that while in all three years the intake of the 30 per cent ground straw ration has been remarkably consistent there has been a decline in the liveweight gains achieved each year. However, at the time of writing, the last experiment is not quite complete and further examination of the final results may provide the explanation. It may be necessary to reconsider the composition of the rations, as recent evidence from Nottingham University is not wholly in favour of the substitution by urea of conventional protein sources in ground straw rations.

It is also probable that fineness of grinding is critical and, although a $\frac{3}{16}$ in. screen has been used in the later work at Nottingham, the effects of varying the fineness of the ground straw between $\frac{1}{8}$ in. and $\frac{3}{16}$ in. are not fully established.

Problems in the feeding of ground straw

The trials described confirm that cattle fed finely ground barley straw eat more of it, and make better use of it than they do of straw in the long form. But there are still practical difficulties to be overcome in the feeding of ground straw. Barley straw milled through a $\frac{3}{16}$ in. screen and handled loose or in bags is very dusty, about four times as bulky as the same weight of rolled barley, and it does not flow, which makes it difficult to move or to mix in a normal vertical-auger type of farm mixer. For these reasons it seems that the processing of straw will have to be a specialist job for people with properly designed equipment. It will solve many of the problems if future supplies of ground straw are made available in the form of pellets. The addition of 25 per cent molasses and pelleting through a ½ in. die produces a firm and very palatable feed, and less molasses may even prove sufficient. In the long run it is probable that complete rations containing

ground straw will in many cases be pelleted rather than just the ground straw component alone, but formulations must first be proved for particular purposes and produced at a competitive price.

Ground straw has never cost less than £14 per ton for the relatively small quantities required for experimental purposes at Gleadthorpe. Some firms are now equipped with suitable machinery to produce it on a larger scale and, therefore, it is hoped, more cheaply. The price at which it is economic to buy ground straw for inclusion in cattle rations will depend on what it is to replace. Trial work has not yet gone very far towards establishing situations in which ground straw feeding might be worth while, but experience suggests one or two interesting possibilities.

At least one commercial company is already offering a concentrate incorporating ground straw for mixing with the customer's own barley to produce a barley beef ration. This sort of development, in which a proportion of the barley in an all-concentrate ration is replaced by ground straw and any deficiency in the protein level cheaply made up with urea, should offer a worthwhile saving in food costs to barley beef producers. There is evidence that animals put on less fat on rations containing ground straw than they do on all-concentrate rations. A ground straw inclusion, possibly at greater than 30 per cent, would be applicable in theory where animals are of a type which tend to get too fat on normal all-concentrate feeding but, in practice, with Hereford cross heifers at Gleadthorpe and Ayrshire steers at High Mowthorpe E.H.F. the use of ground straw rations lengthened the fattening period so that there was no financial advantage over all-concentrate feeding. Perhaps a worthwhile compromise can be found in feeding rations in which the proportion of ground straw to concentrate changes as the animals grow.

If a proportion of the barley in a barley beef ration can be replaced by ground straw without detriment to animal performance or financial return, then ground straw has only to be cheaper than rolled barley to be worth consideration. Barley beef rations will probably be the major outlet for ground straw in cattle rations in the immediate future.

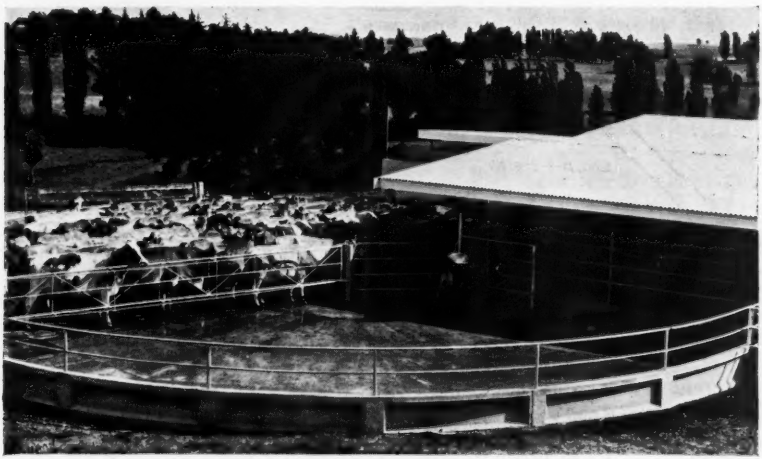
Within the context of an 18-month beef system as described in the opening paragraphs there are situations in which ground straw feeding may be justified. Although a ground straw fattening ration to give equivalent performance will be more expensive than a silage and barley system, by reducing dependence on conserved grass, it should allow more animals to be kept on a given grass acreage, besides reducing the nuisance of silage, both in summer and winter. To be successful in achieving by such means a closer integration of beef cattle with arable farming would be a useful step forward, but it is as yet untried. Such a change will only be implemented over a period of years and its effects on the whole farm organization will need careful watching.

In the meantime we have this new evidence of the improved animal performance that follows the fine grinding of indigestible roughage. It will be extremely interesting to observe the ways in which this knowledge is put to use by farmers and the industry and what place, if any, ground straw will occupy in future cattle feeding practice.

J. F. Usher

Large Dairy Herds in New Zealand (2)

Part I of this article appeared in the August issue of 'Agriculture'



Herring-bone parlour with circular collecting yard and mechanical backing gate

Profitability

The New Zealand dairying story is one of milking a large herd of cows and managing grassland to ensure a continuous supply of high-quality young, leafy grass for as much of the year as possible. Costs and returns for a typical 100-acre North Island dairy farm, run by an owner occupier, are shown on page 432. The figures are representative of a slightly above average producer, but are by no means exceptional, since many leading farms are producing over 400 lb of butterfat per acre. With fairly low costs and a high level of stocking a reasonable net farm income is achieved, provided one is prepared to work hard and not employ permanent labour.

The same farm, share milked, would normally have a lower level of fixed costs, particularly labour and machinery, and possibly a slightly higher gross income to give a net income of £2,000 a year for the share milker, and rather less for the owner, this depending on interest charges and the amount spent on repairs and maintenance.

Typical budget for above average factory supply dairy farmer in the Waikato, North Island, New Zealand, 1966

Data based on N.Z. Dairy Board Economic Survey, 1964–65 and local farm management experience.

Average number of cows		100
Acreage of farm		100
Acreage for cows and young stock		100
Stocking rate, cows per acre (1)		1·0
Milk yield (gal per cow)		600
Fat yield (lb per cow)		300
Milk price per gal 4% fat (pence)		16
Fat price per lb (pence)		40
		£
Gross income	Milk and butterfat	5,000
	Calves	158
	Cull cows	220
	Total gross income	5,378
Variable costs	Seeds, fertilizer and sprays	525
	Concentrates for cows and young stock (2)	50
	Miscellaneous (3)	310
	Total variable costs	885
	Gross margin	4,493
Fixed costs	Labour (4)	420
	Machinery and contractor (5)	625
	Insurance, telephone, office expenses, other sundries	115
	Repairs and maintenance, development	376
	Interest	343
	Rates	92
	Total fixed costs (6)	1,971
	Total costs	2,856
	Net farm income	2,522
	Gross margin per acre	44·93
	Net farm income per acre	25·22

1. **Stocking rate, cows per acre:** Includes young stock at 25 per cent replacement rate. Cow equivalent's per acre 1·20.
2. **Concentrates for cows and young stock:** On many farms this is buttermilk powder only, where used for calf rearing.
3. **Miscellaneous variable costs:** Herd testing, A.I. Vet and shed expenses.
4. **Labour:** Represents casual labour. No charge has been included for the manual work of the farmer.
5. **Machinery and contractor:** All tractor and machinery expenses including depreciation. Car expenses (⅓). £150 has been allowed for contract work representing hay baling and carting, hedge cutting and other jobs, e.g., haulage.
6. **Total fixed costs:** Will be lower on a 50 per cent share milker farm, particularly labour and machinery.

Herring-bone parlours

It has been estimated that in the more intensive dairying areas almost every other farm now has a modern herring-bone parlour. Over the last few years economic necessity has driven producers into keeping larger and larger herds, and the herring-bone is essential when one man is expected to milk a herd of 120 cows, single-handed, as many are now doing. An efficient milker can operate 6 units satisfactorily and put through 9–10 cows per unit per hour, so the 6-unit, 12-standing herring-bone is most common

for herds of 100–120 cows. Spray udder washers are used in all parlours and, apart from being quicker this eliminates the bucket and udder cloth, and has helped to reduce the mastitis problem. All herring-bones now being erected have circular collecting yards with motorized backing gates which can be set in motion from within the pit. Milk dairies containing the bulk tank are generally sited alongside the herring-bone rather than at one end, so that the pit can easily be extended and more units installed if herd expansion warrants this. Cleaning of the parlour and collecting yard after milking is done with a pressure hose normally requiring about 2 gallons of water per cow at each cleaning.

New Zealand milkers can operate 6 units satisfactorily since there is no concentrate feeding or regular recording of milk yield, and also because an efficient collecting yard and system of udder washing can reduce time spent on the work routine.

500-cow herds

As cow numbers are increased, the general practice is to manage them in one herd, rather than in smaller units. Herds of 200 cows are becoming commonplace and are already a feature of the North Island pastoral scene, and judging by the way the dairy industry is moving, the same will soon be said about units of 300. There are a few herds of 500 cows and at least two of 700 managed as single units. It is reasonable to suggest that before long someone will have a single herd of 1,000 cows! Production details of two very large herds visited are of interest. One farm of 330 acres with 300 in grass carried a herd of 500 cows and produced 140,000 lb of butterfat in the year ending May, 1967. This is a production of 280 lb butterfat per cow and 466 lb per acre, at a stocking rate of 1·66 cows per acre. Herd replacements were reared on another farm and no concentrates were fed. This is equivalent to 932 gallons per acre of 5 per cent butterfat milk achieved without concentrates. The other farm totalled 320 acres with 300 in grass, and carried a herd of 460 cows. Production worked out at 289 lb butterfat per cow and 416 lb per acre, at a stocking rate of 1·4 cows per acre. Again no concentrates were fed and replacements were reared on another farm, a system which is becoming increasingly common as stocking rates approach $1\frac{1}{2}$ cows per acre. Butterfat production per acre from both these farms is well above average for land of similar quality, but this is due to good grassland production and utilization by a very high stocking rate rather than to high cow performance.

Both herds were rotationally grazed for nine months of the year, using 12-hour paddocks. The farms were on alluvial silt which poached badly during very wet weather, and in winter each herd was moved to drier ground. However, during the long grazing season there was no visible pasture damage due to poaching, and access to the paddocks was kept free of mud by a 21 ft wide race suitably reinforced with hardcore. With a well laid out paddock grazing system, suitable race and an adequate water supply, a herd of 500 cows in New Zealand appears to present no more problems during the grazing season than the more usual herd of 100–200. In Britain, the main obstacles to be overcome with large herds are those associated with housing and management in the winter. Much of the New Zealand experience is unfortunately not applicable since cows are dry in winter and are seldom housed.

Long herring-bones

On both farms milking was in two adjoining 14-a side herring-bones sited parallel to one another and served by the same collecting yard. With two milkers in each pit milking time was about 9 cows per unit per hour, or 250 cows per hour with four milkers. Five men were employed on each property, and all milkers did field work from 10 a.m. to 3 p.m. Long herring-bones are popular with large herds and they are usually built in multiples of 6 or 8, since one milker can handle 6 and, occasionally, 8 sets of cups. The 24-unit, 24-a side herring-bone is the most common for herds of around 300 cows, and has a throughput of up to 240 cows per hour with four milkers. In the Waikato region of North Island a 32-a side herring-bone erected about two years ago is functioning very well and the herd of 400 cows on this farm will be increased to 800 over the next few years. This unit has a loft over the pit for concentrate storage, and is equipped with office and changing room.

A few of the ultra large herd enthusiasts imagine the size of things to come as a 50-unit, 100-standing single line herring-bone built for a herd of 1,000 cows. A herd of 700 cows were milked in this last season and apparently there were few snags. However, whereas the 24-a side is recognized to be an efficient unit, parlours above this length are viewed with interest rather than envy. Most producers are agreed that the 50-a side is not necessarily the most efficient parlour for a herd of 1,000 cows, and think that two, 24–25-a side herring-bones erected in parallel and served by the same collecting yard would be preferable.

Judging by New Zealand experience long herring-bones, at least up to 24 sets of cups, appear very suitable for large herds. They are an alternative to the much discussed roto parlours in use on the continent and, because they are considerably cheaper and much less prone to mechanical breakdown, should be popular for many of our future large herds, unless the objective is to use a smaller parlour on a shift basis during the day.

Dr. William Davies, C.B.E.

Dr. William Davies, C.B.E., Director of the Grassland Research Institute, Hurley, from 1949 to 1964, died on 28th July 1968.

Dr. Davies, as all who knew him will say, was unequalled in the field of pasture science. His profound knowledge of this science, together with his dynamic approach to the subject, enabled him to establish successfully the Grassland Improvement Station, which was set up by the Ministry of Agriculture and Fisheries in 1940, to investigate methods for increasing grassland production to aid food production during the war years.

The loss of such a dynamic personality will be felt by agriculturists all over the world.

What size is the Efficient Layer?

W. O. Brown

Food consumption

THE poultry farmer can obtain specifications of many of the commercial types of laying pullets available at the present time and these specifications will often include an estimate of daily food consumption at mature weight. This estimate can be very useful since it may indicate whether a bird of very low body weight can consume enough food to allow for maximum production, and in the case of larger birds it is likely to give an indication of the type which will be most economical in terms of food consumption. It is certainly a much more useful figure than the other one which is often available, namely, that for food conversion. This figure is useless for the purpose of comparing various types of layer unless it is accompanied by an estimate of the average body weight of the bird throughout lay, the average production, and above all, the metabolizable energy (ME) content of the diet on which the figure was established. Modern egg production specialists must know these figures before purchasing a particular type of laying pullet.

Body weight

In this article I shall confine my comments to body weight, being one of the important factors which affect the figures for food intake and food conversion which I have mentioned above. Modern types of layers may vary in mature body weight from 3 to 5 lb, but it is well known that their daily food consumption is not directly proportional to body weight. Indeed, there is a much smaller range of variation in the daily food consumption than there is in body weight of the various types. The reason for this is that in all animals the voluntary intake of food (the amount of food eaten when fed *ad lib.*) is related to their maintenance requirement (the amount of food required to maintain body weight only) per unit of body weight, rather than to body weight itself.

Maintenance requirements

Some years ago we commenced work at Queen's University to determine the maintenance requirement of modern types of laying hens since no reliable information was available on this point in the vast body of literature on egg production, and figures for maintenance calculated from egg production experiments were not accurate. We made the direct approach by finding out how the metabolizable energy of the diet was utilized by the hen, by determining the amount of energy she lost or gained below or above maintenance by measuring her heat production by respiration calorimetry. Without going into technical details this approach allowed us to arrive at an exact figure for the maintenance requirement per unit of body weight and the results proved very interesting.

We found that for light White Leghorn type birds of about 3·7 lb weight, the maintenance requirement was 52 kilocalories of per lb body weight, while for medium-weight hybrid brown layers of about 5·3 lb weight the maintenance requirement was only 40 kilocalories of ME per lb body weight. This is a large difference (30 per cent higher) which is related to a difference in the metabolic rate of the two types and is probably an inherited characteristic (see Table, column A on page 437). Furthermore, we found that while the maintenance requirement per unit of body weight of the two types was very diflerent, there was no real difference between them in respect of the efficiency with which they used ME, i.e., the efficiency with which they converted food ME into energy to maintain body weight and to produce eggs and any small amount of body gain.

When these figures are used to calculate the actual daily amount of food ME which is used to maintain body weight we see that there is not as large a difference as one would expect on the basis of body weight in the daily maintenance requirement of the light type, as compared with the heavier type (see Table, column B). Nevertheless, the daily maintenance requirement of the lighter bird is still lower than that of the heavier bird because of its smaller body weight.

Of much more significance in relation to an animal which is fed *ad lib.* to obtain maximum production is the voluntary food intake. As can be seen from the Table (column C), the voluntary food consumption per unit body weight of the lighter bird is some 27 per cent higher than that of the larger bird. The data for voluntary food consumption were established in our work on egg production, where the same type of food was fed to both types of bird at the same levels of egg production. The figures for food consumption (see Table, column D) show that the smaller bird can consume sufficient energy to allow for a daily surplus of 120 k cal ME, which is sufficient for the production of a 2 oz egg daily (see Table, column D-B). It can also be seen from the Table that both types of bird have the same ratio of voluntary intake to maintenance per unit body weight (see column $^{C}/_{A}$ in Table), substantiating the theory mentioned earlier that the level of *ad lib.* food intake in animals is in direct proportion to their maintenance requirement per unit of body weight. The smaller bird therefore has such a voracious appetite that a level of energy above its maintenance requirement is available to it for maximum production at all times. Nevertheless, the total food intake of the small bird is still *below* that of the heavier bird. Thus it must always be the more efficient layer provided that the total monetary return from the number and weight of eggs produced is at least the same as that

from the heavier type over the same feeding period. This approach to the consideration of the food capacity and maintenance of smaller layers may become of increasing importance as smaller types are released for commercial production. The smaller the bird the more important is the requirement that it has a high voluntary food intake per unit weight, otherwise insufficient energy above maintenance will be available to it to produce a maximum yield of eggs.

Daily maintenance requirement, voluntary food intake and energy available for production of two types of layers in terms of kilo calories of metabolizable energy (ME)

		METABOLIZABLE ENERGY (k cal)					
	Body weight (lb)	*Maintenance requirement (k cal)* per lb (A)	per hen (B)	*Voluntary intake (k cal)* per lb (C)	per hen (D)	*Available for production* (D-B)	*Ratio* (C/A)
Light layer	3·7	52	192	84	312	120	1·62
Medium layer	5·3	40	212	66	347	135	1·65

The information on which this article is based can be found in various published papers by Waring and myself and in the U.S. Feed Grains Council booklet, Progress in Livestock Nutrition 1962–67.

The author of this article is **Professor W. O. Brown, Ph.D., D.Sc., F.R.I.C.,** Head of the Agricultural Chemistry Department of The Queen's University of Belfast and also Head of the Chemical and Animal Nutritional Research Division of the Northern Ireland Ministry of Agriculture.

Appointment of Deputy Director, Veterinary Investigation Service, Central Veterinary Laboratory, Weybridge

Mr. A. J. Stevens, M.A., B.V.Sc., M.R.C.V.S., Dip. Bact., was promoted Deputy Director of the Ministry's Veterinary Investigation Service as from 1st August, 1968, following the retirement of Mr. D. W. Menzies.

Biographical note

Mr. Stevens was previously Superintending Veterinary Investigation Officer at Leeds. After graduating from Liverpool University as a veterinary surgeon in 1949, he spent a short time in private practice before a period of post-graduate research training at Liverpool and Manchester Universities, where he gained a Diploma in Bacteriology. Mr. Stevens joined the Ministry's service in 1952 as a Research Officer and was acting Veterinary Investigation Officer in charge of the Newcastle Investigation Centre from 1952 to 1956. He was promoted to Veterinary Investigation Officer in charge of the Cambridge Centre in 1956. He was promoted Superintending Veterinary Investigation Officer in 1965 with responsibilities for Yorkshire, Lancashire and Cheshire.

Mr. Stevens has spent three periods in Egypt on behalf of F.A.O. helping to set up a veterinary laboratory service. His other activities have included lecturing to veterinary and agricultural students at Cambridge and acting as external examiner at Liverpool and Edinburgh universities. He is well known to farming audiences throughout the country, most especially in connection with his work on pig diseases.

The Availability of Calves for Beef Production

R. E. Blake D. T. M. Lloyd

IN the selective expansion programme for agriculture envisaged in the National Economic Development Plan it was suggested that there was room for expanding beef production in Britain, but that additional calves for this would have to come from an increase in the size of the dairy herd. In the autumn of 1965 there was considerable publicity about calf losses and suggestions were made that some of the additional calves could come from existing cows if the losses could be reduced by improving calf housing and calf rearing methods. Very little information was available at the time on which to base any estimates of the potential number of calves that could be available if the losses could be reduced, or of what proportion of the calves that died were poor weaklings that in any case would be unsuitable for rearing for beef.

Survey of calf losses in Monmouthshire

It was decided in Monmouthshire to collect some factual information about the number of calf losses, and at the same time to define the major factors causing losses and to investigate the possibility of control measures that could increase the number of calves available for rearing. A survey was designed which would supply this information and at the same time provide some statistics, that could be applied to the county dairy and beef cow numbers, in order to estimate fairly accurately not only the total calf losses, but also to sub-divide the losses of calves for rearing into six main groups as follows:

1. The number of calves that were not born because cows calved at intervals of more than one year.
2. The number of calves that were still-born before the full time of the pregnancy.
3. The number of calves that were either still-born or died at birth at the end of a full pregnancy period.
4. The number of calves that died on the farm between birth and up to six months of age.
5. The number of calves that were sold from the farm of birth in Monmouthshire, but died on the purchaser's farm between the date of purchase and up to six months of age.
6. The number of calves that were sold for slaughter because they were unsuitable for rearing.

Apart from collecting information on the number of calf losses, details were also collected about rearing methods, accommodation and other management factors, to see if there was any correlation between these factors and calf losses.

In the survey the sample of calves was taken at source, i.e., on the farm where they were born. It excluded calves that were brought on to the farms and this was done for two reasons. It would have been very difficult to achieve a random sample if calves were included which originated from other counties. Secondly, it was felt that the majority of losses were attributable to the management of the pregnant cow and the care of the calf during the first few days or even hours of life. It was believed that the greatest advantage could be obtained from following individual calves from a foetus until they were six months of age.

A sample of 100 dairy and 100 beef herds was taken for the survey. This represented about 10 per cent of the herds in the county. The sampling method used involved the selection of herds on a random numerical basis from each range of herd size. The distribution of herds of various size ranges in the sample was representative of the distribution in the county. The sample, therefore, also contained 10 per cent of the cows in the county. The dairy herds were sub-divided into those selling calves where some or all of the calves born on the farm were sold, and calf rearing dairy herds where the majority of calves were born and reared on the same farm. The dairy/calf rearing group represented about one-fifth of the total dairy herds in the sample.

The survey was carried out in two parts. A preliminary survey of calf losses carried out in retrospect for the period October, 1964, to September, 1965, and a questionnaire which had been sent out to all the farmers in the survey was followed up by visits to all the farms concerned, where details of the accommodation and rearing systems were collected. The first year of this survey covered only the calf losses on the farm of birth; no attempt was made in that year to follow up calf losses for those calves which were sold off the farm.

A full survey was carried out for the period October, 1965 to September, 1966, and in that year not only was information collected about calf losses on the farm of birth, but an attempt was made to trace all the calves that were sold off the farm and to evaluate all losses that occurred during the first six months of the lives of those calves. This necessitated tracing them through the main markets, through the local calf group, and also through dealers. This was an extremely laborious task which was only possible through the exceptionally good co-operation received from all concerned.

No attempt was made to try and classify calf losses according to breed, but the suitability of calves for rearing for beef production from the dairy herd depends, to a large extent, on the breed composition of the county dairy herd. In Monmouthshire, 69 per cent of the dairy herds were mainly Friesian, 10 per cent Channel Island, 9 per cent Ayrshire and 3 per cent Shorthorn, with 9 per cent of the herds mixed and unclassifiable.

Results

The following information was obtained in the preliminary survey from October, 1964 to September, 1965.

Results of preliminary survey 1964–65

	Dairy Selling calves	*Dairy Calf rearing*	*Beef*
% of calves lost in last three months of pregnancy (abortions)	1·4	0·6	1·1
% calves lost at birth	4·1	4·5	4·2
% calves lost on farm of birth, from birth until six months of age	1·8	5·0	4·7

In many cases much of the information supplied in the preliminary survey was based on the farmer's memory but it was felt that the information was sufficiently accurate to be recorded. In the full survey for the year October 1965 to September 1966, farmers kindly kept records and the information given below is considered to be very reliable.

Results of full survey 1965–1966

	Dairy Selling calves	*Dairy Calf rearing*	*Beef*
% cows not calving within the year	10·4	12·3	7
% calves lost from abortion	2·2	2·2	4·4
% calves lost at birth	4·7	6·3	3·3
% calves lost from birth until six months of age on the farm of birth	1·9	3·8	2·8

From the dairy farms which sold calves it was found that 5·6 per cent of the calves died on the purchaser's farm. It was also found that 2 per cent of all the calves born were sold to butchers for slaughter as veal and it was assumed that the majority of these calves were unsuitable for rearing. The information has been used from the survey to calculate the number of calves that are likely to be available for beef production per 100 cows in Monmouthshire.

Calves available at six months of age for beef production per 100 cows

	Beef herd	*Dairy herd*
Calves not breeding in year (corrected for twins)	11	7
Calves that were aborted	2	2
Calves lost at birth	5	4
Calves lost in first six months of life	3	3
Calves required for breeding replacements	29	14
Calves sold for slaughter	2	—
Calves lost after sale	2	—
Calves available for beef production	46	70
	100	100

Results from the final survey indicate that failure of cows to breed regularly is one of the major causes of the loss of calves for rearing, particularly in the dairy herd. Many farmers in the survey were experiencing infertility problems and many had calving indexes of 400 days and above. Efforts directed at improving infertility are likely to be far more rewarding in increasing the number of calves available for rearing than attempting to reduce losses at and after birth. It was impossible within the scope of this survey to investigate the main causes of infertility that occurred. The survey did, however, highlight the need for much more investigational work on the causes of infertility on farms generally.

There was a high rate of abortion in the winter of 1965–1966. The cause of 65 per cent of the abortions which occurred was not specifically identified but 23 per cent which did occur were said to be due to physical causes, probably associated with the very wet winter; twelve per cent were diagnosed as contagious abortion. The higher incidence of abortion in beef herds could be correlated with the fact that only 20 per cent of the beef herds were vaccinated with S.19 vaccine. Other causes of abortion given were salmonella infection, vitamin D deficiency, and twin calves.

Total losses include a considerable number at birth. There seemed to be no correlation between losses and the breed of bull used on the cows. While there is no doubt that the majority of calves lost at birth were unavoidable, improved stockmanship and, particularly, more attention at calving time, could have reduced some of the losses. About 60 per cent of the calves lost at birth were regarded as good calves by the farmer.

Hygiene

When recording the cause of losses after birth, we had to accept the farmer's opinion. In many cases this was based on a veterinary surgeon's diagnosis or a post mortem examination. Approximately 30 per cent of the calves which were lost after birth were lost through scours of one sort or another. There is no doubt that this is a reflection on both the buildings in which the calves are housed and the calf management. In the survey the buildings in which calves were kept were recorded and roughly classified, and the management of the calf house in terms of cleaning out was also recorded.

The vast majority of calves were reared in batches of three to five. Many of the buildings were cold, damp and with inadequate ventilation. They were also insufficiently rendered inside to allow satisfactory cleaning and disinfection. The number of calf houses which had been specifically built for calves was very small, the majority being housed in either stone or wooden buildings which had been adapted for calf rearing. Twenty-five per cent of the calf houses were cleaned out once a year or less frequently and only 35 per cent of them were cleaned out and disinfected or rested between batches of calves. While calf accommodation in the county was generally found to be poor, it was surprising what good results many farmers obtained in poor buildings by extremely good management and stockmanship.

The second major cause of calf loss—21 per cent—was from virus pneumonia. This again is a reflection on the calf building and, in particular, on the ventilation in the buildings. It was interesting to note that virus pneumonia was a major cause of calf loss on the farms where the animals had been purchased.

Three conclusions can be drawn from the survey. Firstly, more calves could be made available for rearing for beef production if more information was known about the causes of infertility, particularly in the dairy herd. Active steps could then be taken to reduce this. Secondly, the elimination of contagious abortion, particularly from the beef herds, would increase the number of calves available. Thirdly, an improvement in calf buildings to make them warm, well ventilated, and easily disinfected, would no doubt reduce losses after birth.

The joint authors of this article are **R. E. Blake, D.F.C., B.Sc., N.D.A., N.D.D.,** County Agricultural Adviser, Monmouthshire, and **D. T. M. Lloyd, B.A.,** District Agricultural Adviser for the N.A.A.S., Monmouthshire.

Children in Danger!

In 1967, one hundred and fourteen people lost their lives through accidents on the farms in Britain, and out of that total, twenty-three were children under fifteen years of age. In the ten years from 1958 to the end of 1967 one hundred and seventy children have been accidentally killed on our farms and ninety-eight of these were under eight years of age. Children's safety must depend on the constant vigilance of parents, farmers and farm workers—especially those who may be driving tractors or other machines in and around farm buildings where children may be playing.

Last year was the worst we have ever known for fatal accidents to children, but who knows whether future years may see an even larger number of these tragedies.

There are numerous accidents when children get caught in moving machinery with the most serious consequences. For instance, a girl, now about twelve years old, who three years ago fell into a corn drier and had her arm torn off. She is now cheerful and happy, but the stark fact remains that she will go through life with one arm instead of two.

Under the present regulations applicable to children it is not an offence to cause or permit someone over the age of 13 to drive a tractor but at least two boys were killed last year because they were given jobs to do which were quite unsuitable to their stature, strength and experience. Remember that those who make tractors design them to be driven by adults and the various controls are placed with this in mind.

We all wish to see a big reduction in accidents to farmers and farm workers and all adults who live and work on the land are asked to make a special effort to stop this terrible waste of young and innocent lives. Be ever vigilant and careful of those who are too young to take care of themselves.

This is an account by a Divisional Veterinary Officer of the foot-and-mouth outbreaks in the West Midlands area during November and December, 1967. It includes the extent of the organization necessary to master the disease, such as the deployment of the Ministry staff and the co-ordination of the help given by so many willing individuals and other bodies

Foot-and-Mouth Disease (1)

J. Edwardson

The disease

IN 21 days there were 32 outbreaks of foot-and-mouth disease in Worcestershire. Ten of these were found by veterinary staff, 22 were the result of early reporting of suspicions by livestock owners. In the same period some 238 reports of suspected disease were handled; this was an average of 11 per day and varied from one to 21 in single days. Twenty-nine outbreaks were in an area 7 miles by 4 miles. Thirty-one in an area 7 miles by 6 miles. Outbreak No. 9 was unrelated and not near the above areas.

On 16th November, 1967 the first outbreak of the disease in Worcestershire was confirmed.

Disease occurred in pigs only and it was immediately apparent that skimmed milk fed to the pigs on 10th November was the probable source of infection. Investigation revealed that this milk, distributed by a Staffordshire organization, had probably come from the already infected area of Shropshire and Cheshire via a Warwickshire dairy.

Outbreaks No. 2 on 17th November and No. 3 on 18th, were on premises in the same ownership as outbreak No. 1 and all were in pigs similarly fed on skimmed milk. In the series of outbreaks which followed, no further disease was seen in pigs.

The initial outbreaks occurred in open-fronted buildings and it is possible that birds were responsible for some of the local spread of disease.

Outbreak No. 4 came after an interval of only one day on 20th November, in cattle, where the first affected animal may have had contact with the vehicle carrying skimmed milk, but this was by no means the full explanation, because disease was found simultaneously in cattle wholly at pasture. Farmers were requested to house animals wherever practicable, to draw animals away from boundary fields, and to avoid outdoor trough feeding, as precautions against bird and airborne infection.

Eighteen outbreaks arose at pasture, six in yards or open-fronted buildings, and eight in housed animals. Spread initially in the general Spetchley area was believed locally to be from the original three cases by birdborne and airborne means.

There was no evidence to suggest that infection was conveyed by persons, animals, vehicles, feedingstuffs or other materials, save in outbreak No. 9. In the latter, infection was probably conveyed from another county in an infected vehicle to premises in North Worcestershire.

Outbreaks Nos. 5, 6 and 7 were confirmed in cattle on 21st November, around outbreak No. 1. Outbreaks Nos. 8 and 9 came on 22nd November; 10, 11, 12 and 13 were confirmed on 23rd November, 14 and 15 on 24th November.

Outbreaks Nos. 16 and 17 were confirmed in sheep on 25th November. These were the first occurrence in the species. Other cases in sheep were No. 20 on 26th, No. 26 on 29th, No. 28 on 30th November and No. 30 on 3rd December.

Thus there were six cases in sheep, all towards the end of the series, and it is significant that four of these were found by veterinary staff carrying out patrol inspections within two miles of outbreaks. It was obvious that owners did not recognize disease in sheep so readily as they did in cattle or pigs, especially when the symptoms were overshadowed by a high incidence of foot rot.

Then came 'black Sunday' 26th November, when five outbreaks, Nos. 18, 19, 20, 21 and 22 were confirmed. Another of the suspected cases was confirmed on a later day in another county. 'Black' also because the disease had previously appeared to creep and not jump—spread had been to adjoining farms, but then came outbreaks in the directions of four points of the compass and at greater distances than previously experienced in the Spetchley area. 'Black' because the number of outbreaks further north in Shropshire, Cheshire and Staffordshire was extraordinarily high and soaring. All operations had been directed with energy to prevent an explosion. Some natural barrier against spread was afforded by the built-up and developing area of Worcester City.

Investigations, diagnosis, confirmation, valuation, slaughter and disposal of carcasses were, on average, completed within a twenty-four hour period. Nevertheless, increase in the number of obviously affected animals was rapid and the risk of airborne infection was enhanced by prevailing winds and any delay. Getting in front of disease rather than chasing behind it was the predominant ambition. Veterinary staff, valuers, slaughterers and contractors were poised to move whenever incidence of disease was reported or suspected. Everything was done urgently.

Outbreak No. 23 occurred on 27th November, followed by Nos. 24 and 25 on 28th November, No. 26 on 29th and Nos. 27 and 28 on 30th November —28 outbreaks in 15 days was rapid build-up, but then came two days lull. The last four cases in the series were found by the department's staff—Nos. 29 and 30 on 3rd December, No. 31 on 4th December and No. 32 on 6th December.

Fortunately, disposal of carcasses was by burial, but this was possible only by ascertaining the location of watercourses. The necessary preliminary precautions regarding sites required urgent and rapid attention, which was always forthcoming from the appropriate authorities—the presence of overhead cables, of powerlines, of underground lines of gas, water, electricity and petrol undertakings. On occasions, difficult access to farms created problems. The movement of heavy equipment presented difficulties.

Dealing with infected herds was but one very important aspect of the fight against the disease. Immediate assessment of the risk of spread to neighbouring premises was a constant priority. The vital decisions were often more distressing for these owners than for those of infected herds.

Then came the work of tracing other possible means or risks of spread of disease—previous movements of animals to and from infected places,

movements of vehicles, movements of persons and of materials. Bromsgrove Market was being held on the day when the disease was first confirmed and disposal of animals required arrangement and tracing. Kidderminster Market, held on 14th November, contained animals which had been removed from a subsequently infected herd. This demanded full tracing, restrictions and a repeat veterinary inspection on premises of destination. Gloucester Market held on 16th November was involved by movements of a possibly infected haulage vehicle, and the relative portion of tracing in Worcestershire was undertaken (Case No. 9). Previous and subsequent movements of the vehicle required similar tracing. Movements of motor vehicles delivering skimmed milk, and those collecting fresh milk required veterinary investigation. Movements of persons investigated included those of veterinarians who had visited farms before 16th November, visits by agricultural travellers and others. The use, treatment and disposal of skimmed milk, inspection and advisory visits to dairies, markets, slaughterhouses, all required timely attention.

Another large task integrated with the others was the veterinary inspection of all animals on premises within two miles of infected places. This work served several purposes—early detection of disease, checking for old disease, discussion and advice to stock-keepers, welfare of animals assessment, and consequential licensing of essential movements. Contagious livestock was inspected daily whenever possible. Constant vigilance was kept on a herd of 250 deer confined within a park in the infected rectangle. Deer are listed as susceptible animals, but recorded cases are very few.

The staff

When the first outbreak occurred in Worcestershire, the whole-time staff of Animal Health Division was heavily committed in Shropshire and Cheshire. The Local Divisional Veterinary Officer was involved at Oswestry and, in his place, the D.V.O. from Warwickshire took over. The Deputy Regional Veterinary Officer came from Aberdeen and the Regional Veterinary Officer from London. Available whole-time Veterinary Officers were scarce and, as always with foot-and-mouth disease, no-one could foresee what lay ahead. Local veterinary surgeons volunteered as Temporary Veterinary Inspectors—at first they left their practices in the county, then came others from further afield—from Devon and Dumfries, from Sussex and Suffolk.

The field service of Animal Health Division was supplemented by members of the Veterinary Investigation Service and Central Laboratory staffs. Later came veterinary colleagues from overseas. First, two Canadians from Vancouver and Saskatchewan: then came two Australians from Victoria and New South Wales. Later came two Americans from Mexico and Minnesota.

Many were unfamiliar with the disease, many not conversant with the Statutes and methods covering the slaughter policy, and some with only distant knowledge of our country. As each group arrived, its members were briefed and equipped with protective clothing, stores and forms, vehicles and driving permits for overseas visitors.

Briefing meetings held daily for all staff served important purposes—the allocation of the next day's work, précis of the day's happenings, talks on disease problems illustrated by films and slides, discussion and resolution of problems.

The arrangement of duty lists and allocation of work took account of the need for very experienced men in some sectors, the deployment of 'clean' and 'contaminated' personnel, the demand of the different sections of work—suspected cases, confirmed cases, tracings, patrol, office work, the availability of veterinarians and the demands from control centres in other parts of the country. Over one period of fourteen days there were 55 veterinarians, all fully employed. These were joined by a supporting team of Ministry staff: the Agricultural Land Service officers, National Agricultural Advisory Service officers and the Field Officers of all grades who gave tremendous assistance on infected places. The typing, clerical and executive staff gave invaluable service in dealing with typing, telephone and clerical duties. In addition, police officers did liaison duties. There were Technical Assistants of Animal Health Division, G.P.O. Officers, Welfare Officers and members of the W.V.S. All worked as a team for long hours every day. Only those privileged to work in the team or witness its activities could appreciate the atmosphere of determination to win the battle against disease.

Part 2 of this article will appear later and will cover the control centre and communications for the operations.

The Ministry's Publications

Since the list published in the August, 1968, issue of *Agriculture* (p. 398) the following publications have been issued.

MAJOR PUBLICATIONS

Bulletin 71. Soils and Manures for Vegetables (Revised) 6*s.* 3*d.* (by post 6*s.* 9*d.*)
,, 194. Control of Aquatic Weeds (New) 5*s.* 9*d.* (by post 6*s.* 3*d.*)
,, 198. The Small Poultry Flock (Revised) 3*s.* 9*d.* (by post 4*s.* 2*d.*)

MECHANIZATION LEAFLET

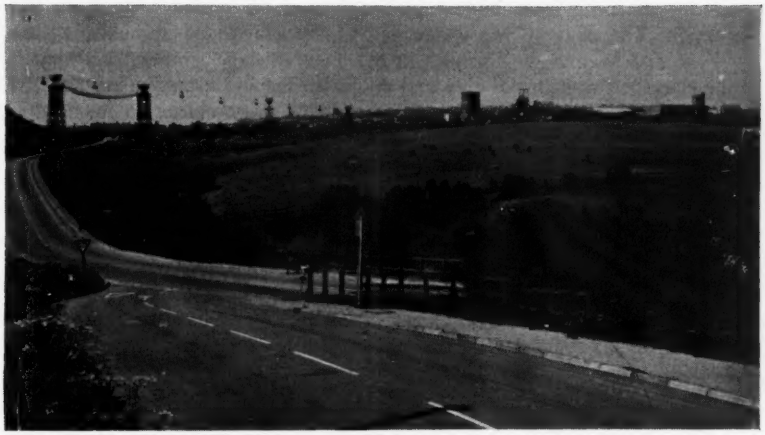
No. 14. Boilers for Nursery Use (New) 1*s.* (by post 1*s.* 3*d.*)

FREE ISSUES

ADVISORY LEAFLETS

No. 42. Codling Moth (Revised)
No. 126. Pea and Bean Beetles (Revised)
No. 320. Poultry Manure (Revised)
No. 428. Preparation and Trussing of Poultry for Market (Revised)
No. 429. Fertility and Hatchability in Fowls (Revised)
No. 482. Ensiling Grass (Revised)
No. 491. Nematodirus Disease in Lambs (Revised)
No. 492. Saw-toothed Grain Beetle (Revised)
No. 528. Common Chickweed (Revised)
No. 555. Virus Diseases of Chrysanthemums (New)

The priced publications are obtainable from Government Bookshops (addresses on p. 456) or through any bookseller. Single copies of the free items are obtainable only from the Ministry (Publications), Tolcarne Drive, Pinner, Middlesex.



15. North East Durham

D. T. Evans

THE area, roughly rectangular in shape, lies between the Great North Road and the sea. It is bounded in the north by the Tyne estuary and in the south by an arbitrary line from Durham City to the coast.

The whole area is on the Durham coalfield. Running diagonally from Durham to South Shields is the magnesian limestone, which divides the coalfield. To the west the coal measures are exposed, but on the eastern half they lie under the limestone and other surface rocks giving a 'concealed' coalfield. Under the coal measures is a layer of millstone grit overlying carboniferous limestone. The area has been glaciated and most soils are derived from boulder clay, but some pockets of sand and gravel exist. Rainfall amounts to 25–30 in. per annum and drainage is mainly into the Rivers Tyne and Wear, though a number of burns run direct to the sea through picturesque denes.

The northern half of this undulating lowland lies between 0 and 300 ft, but most of the southern half is between 300 and 500 ft. The area has many mines, and the shafts and waste tips, works and factories, together with the power lines and other services for large conurbations of people are a feature of the landscape.

The importance of the coalfield dates from the fourteenth century when coal was exported by sea to London for domestic use. The pantiles so common on roofs were ballast in the barges on return trips from the Continent. The demand for vessels led to the growth of shipbuilding on the Tyne and Wear. The 14 miles of the Tyne estuary are lined with yards as the river bed was glacial clay and could be deepened, compared with the Wear which is of resistant rocks, thus confining shipbuilding to its mouth. As coastal seams became exhausted roads and railways were developed for transporting the coal from further inland to the ships.

This industrial expansion encroached on farming from early times, but both have progressed and are very much interwoven. The growth of towns has provided a market at hand, but farming has suffered from the continued expansion of towns, trading estates and services, especially when new towns are created like Peterlee and Washington. Higher populations also create the problems of trespass and dogs, which probably account for the fact that the area has only about 2,000 ewes. Mining results in subsidence when old seams collapse so that contours change and drainage is upset. On the exposed coalfield there has been some opencast working but restoration is now reasonably successful.

Generally speaking there are two broad systems of farming. Firstly, there is dairying which ranges from the very small producer up to the farmer with a large dairy herd and arable crops as basic land using enterprises. The average dairy herd is 36 cows compared with 26 for the county as a whole. Most herds are self-contained and loose housing is increasing.

Secondly, there are the cropping farms given over mainly to the arable cash crops, winter wheat, spring barley and main crop potatoes. Beef cattle, as a subsidiary enterprise, frequently comprise finishing the maturer home-bred and Irish stores. These farms tend to be larger and less intensive, particularly on the livestock side.

The resulting overall pattern of cropping is:

40 per cent under grass (50 per cent of which is permanent)
50 per cent cereals (of which 66 per cent is barley, 25 per cent wheat)
10 per cent other crops (6 per cent potatoes, 4 per cent forage crops)
(The acreage of root crops is falling.)

Horticulture, pigs and poultry play a subsidiary part in the economy, but pigs are more important than poultry. Small livestock are found on most farms but there are some specialist units.

Whatever the resources and farming pattern of an area the industry's 'leaders' are always looking for new developments. A successful example is that of a co-operative venture to promote seed potato growing. The Durham Seed Growers' Association was formed in 1960 and has grown up under the chairmanship of Sidney Gibson of Boldon. He and his three sons farm over a thousand acres in the county, which includes 60 acres for seed potatoes. The group, now a Limited Company, was formed to market members' seed potatoes, their aim being to produce a quality product, that is inspected after dressing, before marketing under a brand name. The company bulk buys some requisites, hires mobile graders to its members and may extend these services. This example of effective co-operation should encourage those considering similar projects under the Co-operation Section of the Agriculture Act 1967.

A Controlled Environment Piggery

K. B. Briggs, *Agricultural Land Service, Huntingdon*

MR. MANSER, of Wrights Drove, Crowland, Lincs (Holland) farms 278 acres and has a breeding herd of 80 sows. All the progeny are sold to a Wholesale butcher at around 180 lb live weight. Until recently, the final fattening accommodation for the pigs was in uninsulated houses and the conversion ratio of food to liveweight gain was over 4 : 1. Mr. Manser came to the conclusion that this was not economic and so decided to erect an environment controlled piggery to improve the conversion with automatic feeding to reduce labour.

The piggery is a conventional Danish layout with a 3ft 6in. dunging passage down either side, a 4 ft passage down the centre and a food store. Feeding is with dry meal on the floor, fed automatically, which dispenses with troughs; and the front wall of the pen is movable to adjust the sleeping quarters for the number and size of pigs in each pen. There are no windows.

The floor of the sleeping quarters is of lightweight concrete over a deep bed of hardcore and 500-gauge polythene sheeting. The building is of prefabricated timber frame construction, with walls clad externally with pressure-treated horizontal weather boarding. Careful attention has been paid to wall insulation which consists of 2-in fibreglass, while internally, the building is lined with fully compressed asbestos sheeting. A vapour seal of building paper is inserted between the fibreglass and the internal lining. The low pitched roof is of corrugated asbestos incorporating 2 in. of fibreglass and fully compressed asbestos sheeting; the pens are timber framed, faced with flat fully compressed asbestos sheeting.

The theoretical 'U' value of the walls and the roof is approximately 0·1 compared with the generally recommended figure of 0·12 for the roof and 0·33 for the walls. A better comparison is the 'C' value, which is obtained by dividing the total transmitted heat loss (per hour per °F difference from air to air) from the building by the number of pigs housed. The lower the 'C' value the better the insulation properties and usually a 'C' value of 2·5 is considered to be a very well-designed and insulated building. In this case, assuming the piggery is stocked with 120 pigs, the 'C' value works out at 1·7 which compares favourably with the figure of 2·5.

There are four variable speed inlet fans, each capable of 2,320 cu. ft per min, in the roof of the building and the outlets are situated in the eaves of the outside walls. With the high air change capability there is no condensation

in this piggery and the accepted standard of 8 cu. ft per min. per pig in winter and up to 40 cu. ft per min. per pig in summer can easily be achieved.

Automatic on-floor feeding is by a chain and flight conveyor, fed by a 5 cwt hopper, which passes down the centre of one row of pens, returning by the centre of the row on the other side, to form a complete circuit. There are twelve outlets in the conveyor over each pen and the size of the outlet is controlled by a shutter operated by a single screw. It is essential that the meal is clean and free from any dirt or straw, otherwise the outlets become blocked. The conveyor runs automatically for ten minutes at six-hourly intervals throughout the day and night and permits rationing to be carefully controlled, depending upon the numbers and ages of pigs in the pen.

Pigs are brought into the piggery from the weaner pool at about 70 lb live weight and put into a pen. The front is pushed inwards to confine their sleeping quarters to assist in keeping the pens clean. They are sold at around 180 lb live weight and the complete pen is sold at one time, irrespective of weights. When the pigs first come into the piggery they are fed about $2\frac{3}{4}$ lb of meal a day and even when they have reached 180 lb live weight the amount of food a day never exceeds $3\frac{3}{4}$ lb per pig.

Cleaning out is very simply done in a matter of minutes with a squeegee pushing the slurry (no straw is used in this piggery) down the dunging passage to a manhole where it flows to a tank and is then pumped on to straw to make a straw sandwich.

The piggery has not been in operation for very long and no accurate figures have yet been worked out but progress to date indicates that the pigs gain 110 lb in 90 days and are fed on average $3\frac{1}{4}$ lb of meal a day, which means an improvement in conversion to something in the order of 2·9 : 1. The mixture used is of the very best quality and includes about 50 per cent of home-grown barley.

The cost of the piggery including automatic feeding, electric wiring, connection of water, concrete aprons and slurry disposal worked out at about £2,500. Assuming that a reasonable rate of stocking for the building would be about 120 pigs, this would work out at £20 10*s.* per pig.

Undoubtedly, Mr. Manser has provided himself with a good, well insulated piggery with easy working conditions. This, combined with first-class management, so essential for an intensive enterprise of this nature, has enabled him to achieve his main objective in lowering the conversion ratio.

The Farm as a Business

No. 4 Aids to Management

price 2*s.* 6*d.* (by post 3*s.*)

One of the series under the general title *The Farm as a Business*, this booklet is a revised and enlarged edition of that first issued by the Ministry of Agriculture, Fisheries and Food in 1963. It covers the noticeable trends in production and explains the various systems of pig keeping and fattening, including intensive breeding and the economics of weaner production and pig fattening; whether the choice of market be as pork, cutter, bacon or heavy pigs. Up-to-date input/output data and physical data and other statistical information is provided as a general guide to the pig enterprise.

The information given will be of value in farm management advisory work, especially for comparisons against actual farm performances and for forward budgeting and planning.

Copies are obtainable from H.M. Stationery Office, Government Bookshops (address on p. 456) or through any bookseller.

in brief

- **Potatoes: Root of criticism**
- **Bamber Bridge**
- **Safe cereals**

Potatoes: Root of criticism

A new compulsory minimum grade for potatoes, introduced by the Potato Marketing Board last month, should go some way towards promoting the growers' image in the housewife's mind. Higher grades, based on quality and size, are also being recommended. During the past few years the quality of maincrop potatoes has come in for a good deal of criticism.

Investigation on the scale of a national opinion poll is not necessary to establish the fact that housewives generally have been far from satisfied with the standard of product they can usually obtain in the greengrocer's shop; and since the average household expenditure on this article of food (excluding chips and crisps) is around 3*s.* 6*d.* a week, it is an important item in the food bill.

The Nottingham University survey in 1965 showed that a reasonable degree of price fluctuation has no significant effect on the demand for potatoes, and for this reason alone, if no other, the opinion is growing that the ordinary housewife would be willing to pay a little extra if she could be assured of a top quality product. The housewife of the 1960s is shopping in a completely different world from that of her mother. Her High-Street education is such that she has come to expect standardized products of known quality attractively presented.

This point was made in the Consumer Committee's Report for 1966, in which it was said: 'We have considered quality and presentation and are of opinion that this is the aspect of potato production which really calls for some improvement. Improved grading and dressing out of potatoes before dispatch is likely to benefit both retailer and consumer alike.'

Prepacking of potatoes has certainly been a move in the right direction and has fitted in well with the changed structure of present-day retail trade. Some 16 per cent of potatoes is marketed in this way, usually in polythene bags; they are cleaner, more pleasant to handle and have less wastage than those sold loose. But against this is the complaint about the onset of 'greening' soon after the bag is exposed to the light. Buying unseen in a standard pack, paper-wrapped, as in the U.S.A., may be the solution here so long as the contents are consistently marked and guaranteed as to high quality.

But if the housewife has her point of view, so have growers and the trade. More rigorous grading and dressing of ware means higher costs and greater wastage. The tonnage of sub-standard tubers will inevitably be increased, and this in turn implies the need for more processing channels to take up the rejects.

It has also to be recognized that consistently high standards of production in sufficient quantities to keep the market steady are not easy in Britain's unpredictable climate and over a number of different soil types. Given a warmer and drier climate, with correspondingly less trouble in harvesting, to say nothing of disease hazards,

growers would be better placed to meet the housewife's quality demand. Nevertheless it is clear that sooner or later this demand will have to be met and growers recompensed accordingly. More careful lifting and handling from field to market are steps that could often be taken more immediately, and if growers' names and addresses appeared on every sack, the housewife would at least be able to identify the origin of what she is buying.

Bamber Bridge

The modern way of getting the daily pinta to growing urban populations is well exemplified by the M.M.B.'s Bamber Bridge Creamery just outside Preston, Lancs. Set up over thirty years ago, it has recently been completely re-designed, equipped and automated to process, bottle and retail up to 50,000 gallons of milk a day from over 600 farms in Lancashire. Four hundred filled and capped bottles a minute come off the production lines, and during the peak holiday season in neighbouring Blackpool, Southport and Morecambe as much as a quarter of a million pints are bottled every day.

Trucks carrying up to 16,000 bottles distribute to eight M.M.B. depots catering for 129 milk rounds and serving 46,000 customers. But this accounts for only about half the milk bottled at Bamber Bridge; the rest goes to dairymen throughout West Lancashire.

Bottling, however, is just a part of the business at this giant creamery. Some 24,000 gallons of milk a day are separated into fresh cream and skim milk. U.H.T. cream, which will keep for two to three months without refrigeration, is also made.

An interesting feature of the pasteurizing process is its economy in heating and refrigeration. Over 90 per cent of the heat needed to raise milk to bacteria-killing temperature (161 deg. F) comes from milk already pasteurized and still in the holding unit. The hot pasteurized milk is cooled by the incoming cold milk.

Safe cereals

All may have been safely gathered in, but the corn harvest faces new risks as soon as it gets into store. The whole pace of cereal harvesting nowadays, with combine harvesters calling the tune, is such that the pressure on drying facilities may result in a rushed job and inadequately dried and cooled grain, so extending the best possible invitation to a variety of insect pests and moulds that can make havoc of a year's work. The greatest risk perhaps comes from the saw-toothed grain beetle, which at between 65 and 100 deg. F finds conditions so congenial that it will multiply alarmingly, even within a few weeks of harvest.

Scrupulous farm store hygiene will, however, avoid trouble from this pest, since infestations begin with adults already there—in dust or other cereal residue—or introduced by infested bags taken out into the field on the combines.

Meticulous cleaning is therefore only a commonsense precaution, preferably followed by a spray made up from a malathion water dispersible powder. The rate to cover a surface of 1,000 sq. ft is 10 oz of a 25 per cent water dispersible powder to one gallon of water, or 8 oz of a 30 per cent powder.

Infestations of saw-toothed grain beetles are all too frequently found in many kinds of stores, especially likely where bought-in feedingstuffs are kept. Don't therefore allow these sources to contaminate the bright new grain of the 1968 harvest.

AGRIC

Books

Wood as Raw Material. GEORGE TSOUMIS. Pergamon Press, 1968. 80*s*.

The author states that this book is written not only for the classroom, but also for those employed in the forest and wood-using industries, and for the architectural and engineering professions.

The book is divided into twelve chapters, each dealing with one aspect of the subject and ending with an exhaustive bibliography.

The botanical classification, geographical distribution and commercial importance of various timbers is discussed, followed by chapters on macroscopic and physical characteristics, the description of wood as seen under a microscope, its chemical composition and the mechanics of wood formation.

Abnormalities or defects including those, often referred to in the architect's specification, such as shakes and knots, are explained, as also are resin pockets and colour deviations. The structure of the stem (trunk) of the tree is described and the reason is given for referring to what are commonly termed annular rings as growth rings. Among the physical characteristics listed are colour, lustre, odour, texture, grain and figure, weight, hardness and even taste.

The various causes of degradation of wood are discussed in detail, and the reasons for timber warping are given. The final chapter explains methods of identification by the use of 'keys' and card recording. There is an appendix giving techniques for the microscopic investigation of wood.

The book is written for the botanical student rather than the practical carpenter or joiner but, nevertheless, explains many characteristics and defects in wood which are of interest to the professional student.

One minor error occurs in the formula for the conversion of degrees Centigrade to Fahrenheit, which should read $^9/_5$ °C + 32 = °F.

A.G.J.

9th International Congress of Animal Production (Report of Proceedings and Invited Papers). Oliver and Boyd, 1967. £5 5*s*.

The 9th International Congress of Animal Production took place in Edinburgh in August, 1966. Though invited papers were read by thirty-four experts covering a wide field of animal production interests, the emphasis was on the topical problem of intensive animal husbandry.

This volume presents the full text of these papers, which are published in the language of their presentation (English, French and German), and in addition carries a summary of the Congress activities and a list of persons attending.

To attempt a review of any of the individual papers would do less than justice to the tremendous care and detail taken by each author in dealing with a range of problems, many of which are at the threshhold of current learning: so much so, that readers may be left with a multitude of questions to which there appears to be no answer. In part, this may be due to the fact that though the book faithfully reproduces the original paper it does not provide coverage of the wide range of discussion between members and authors which followed.

Of the thirty-four papers reported, ten are in either French or German, so though the English reader has an opportunity to appreciate a high proportion of the contributions, there are a number of most interesting papers which require translating facilities.

An encouraging background to the work of the Congress and the material presented is the awareness shown by scientists of the needs of the world in terms of food requirements and the efforts being made throughout the world to improve the contribution made by animal production to the welfare of mankind. That these efforts may involve some revolutionary thinking is apparent from the section surveying the problems of intensive production, and a wide range of papers show the potentials offered by modern breeding concepts and a fuller knowledge of nutritional requirements.

Though in some areas production is still the main concern, effective distribution becomes increasingly important, particularly in the more advanced economies of the western world, and a section provides some thought-provoking ideas on the problems facing supply and marketing in an environment of intensive methods.

This is essentially a book for reference and as such will be of considerable value to workers throughout the field of animal production.

G.H.B.

The Major Insect Pests of the Rice Plant. (Proceedings of a Symposium at the International Rice Research Institute). Oxford University Press, 1967. £6

Although rice is not grown commercially in Britain there is much to interest our entomologists and plant pathologists in this volume of papers given and discussions held at the 1964 I.R.R.I. Symposium.

Thirty-six papers were presented at eight working sessions, starting with a group of three papers on the taxonomy and biology of the stem borers which are thought to be a major cause of low rice yields in many parts of the world. Population dynamics were considered at the second session, and Torii presented a particularly useful paper on the statistical methods appropriate to stem borer work; he emphasized the influence that changes and improvements in farm practices have on pest populations, and suggested a way in which conventional regression estimates may be adjusted to take account of environmental changes. The other papers in this session included a detailed assessment of Light Trap methods (Ishikura), and two papers on forecasting outbreaks (Yoshimeki, and Lew and Liu). Physiology, nutrition, and mass-rearing problems were discussed at the third session and, as Newsom pointed out in his review at the final session, the standard of excellence could well serve as a pattern for much needed research on the physiology of all major pests.

In the fourth session the assessment of crop losses was discussed by Ishikura, and by Israel and Abraham. Fully satisfactory techniques for loss assessment have not been developed for stem borers, and virtually nothing has been done on estimating the importance of the many other pests and diseases of rice, and the economic feasibility of controlling rice pests over big areas is still a matter for conjecture. Much work is, however, in hand on the chemical control of rice pests and the seven papers on this subject in the fifth session ended with one by Ueda on hazards and residue problems: in general, the organo-phosphorus, and some carbamate, insecticides seem more promising than the long-persistent organochlorine materials.

Six papers in the sixth session dealt with the cultural and biological control of rice pests, and led to the conclusion that all available control techniques should be integrated into a unified programme; but there is a big gap between the often unsophisticated agriculture in many areas where rice is grown, and the highly sophisticated production techniques developed at research stations. Thus, 'applied entomology has not been able to bridge the gap successfully in many areas, and agriculture has not been able to benefit fully from the accomplishments in specialized fields of entomology'. The two final paper-reading sessions were devoted to three papers on 'less important' pests: gall midge, leafhoppers, and the rice bug; and to eight papers summarizing the present status of work on rice pest control in the U.S.A., Thailand, Ceylon, the Phillipines, Malaysia, East Pakistan, Korea, and Indonesia.

Newsom and Painter reviewed the 36 presented papers in the final session, and the volume ends with short reports of five Special Committees set up at the start of the Symposium to consider taxonomic, statistical, pesticidal and liaison problems, and an invaluable index extending to over 22 pages.

The reports follow logically from points raised in the discussions which are summarized throughout the book. The volume, which comprises the most complete bibliographical record in English of material on rice pests, can be usefully studied by all who are concerned with the most important single food crop in the world.

A.H.S.

Soils of the Reading District. (Memoirs of the Soil Survey of Great Britain). 1968.

This book is a welcome addition to the memoirs published by the Soil Survey of England and Wales. An area of 216 square miles has been surveyed, including the Thames Valley from Goring to Shiplake, the lower sections of the Kennet and Loddon Valleys and extends on to the lower slopes of the Chilterns and Berkshire Downs. The soils have been formed on relatively recent geological deposits of the Cretaceous and Eocene formations mainly the Upper and Middle Chalk, London Clay and Reading Beds; and also on Plateau Drifts on the higher land and alluvial deposits in the valleys.

There is a great deal of valuable general information on the area. The climate is dealt with briefly but effectively. There are sections on geology and land use, though the latter is mainly an historic account, and an interesting chapter on geographical relationships. Three photomosaics and one aerial photograph do much to enhance the text; these show the terrain and field pattern associated with a range of soils. There are also plates of the area surveyed showing soil drainage class, land affected by high-water

table, surface soil texture, stony soils and gravel, land types, soil groups and land use. Some of these are most useful, for example, on Plate X one can see at a glance the areas prone to flooding.

The soils have been examined by making borings with a 3 foot auger at an average intensity of 1 per 5 acres. From these and observations of vegetation patterns and land form, boundaries were drawn between soil mapping units. A description of the soils of each mapping unit is given with an account of their formation and location. Their features affecting land use have been briefly discussed and the soils have been classed into nine types.

This book is recommended to farmers or growers and to anyone in the area with an interest in the countryside.

Copies may be obtained from the Librarian, Rothamsted Experimental Station, Harpenden, Herts. Price 30*s.* (including a soil map, one inch to the mile).

T.B.

The Potato (2nd Edition). W. G. BURTON. H. Veenman and Zonen. Hfl 40 (approx. £4 3*s.*). (Members of the European Association Hfl 32 (approx. £3 14*s.*).

This book gives a comprehensive survey of all aspects of the potato and is written as a review of published literature with particular emphasis being placed on the physiology of the plant and the tuber. It is a book primarily for the student or the specialist, and it demands a basic understanding of some biological principles and some elementary biochemistry to gain maximum knowledge from it.

More than fifty pages, i.e., about one-seventh part of the book, are devoted to the bibliography with a list of almost 1,500 references. To gain any benefit from this part demands access to a well-stocked library and even the thesis-writing student would have welcomed some selection here. Few of the papers refer to work published after 1963 and page numbers in the bibliography do not agree with those given in the author index.

The potato grower will gain very useful information from the chapters on composition of the tuber, nutritive value, cooking quality and the physiological changes during storage. With the emphasis on quality and the increasing production of potatoes for processing, these aspects are of great importance and some understanding of the processes involved is essential in order to control them.

J.D.I.

Farm Accounting and Management. F. STURROCK. Pitman and Sons, 1967. 27*s.* 6*d.*

This is the fifth edition of a popular text-book, first published in 1947, which is intended primarily for students at agricultural colleges and farm institutes. With each successive edition, it has deservedly built up a reputation for its up-to-date treatment of farm accounting and farm management techniques and this latest one includes, for example, chapters on programme planning and on capital profiles.

Part I deals with the cash analysis method of book-keeping and, in forty pages, provides an uncluttered outline of the basic structure of accounts and balance sheets. Double-entry book-keeping, once and for so long the standard basis of college and institute teaching, is dealt with later in the book, in the space of some three pages.

Part II, the Business Side of Farming, covers in sixty pages: banking and credit; running the farm office; owner-occupiers and partnerships; valuations; and other methods of book-keeping. Part III entitled Farm Organisation and Management takes up some 120 pages and includes chapters on records analysis; gross margins; budgeting; programme planning; capital profiles; livestock farm planning; specialization; and taxation.

The great value of this book is in the clear and concise way in which the author outlines the rudiments of recording, analysis and planning procedures, and at the same time relates these to more advanced techniques. Its wide-ranging coverage—from crossed cheques to corporation tax and from livestock movement books to linear programming—also gives it appeal as a handy book of general reference. Because of space limitations, several subjects are dealt with only in bare outline, but the author usually succeeds in pin-pointing the essentials of various concepts—his brief explanation of the 'herd basis' treatment of livestock for taxation purposes is a good example of this. Although generally up to date in the treatment of the whole subject, the chapter on analysis of farm records does retain explanations of a number of ratios which are no longer in common use.

Clearly, this is a book which must be strongly recommended for agricultural college and farm institute students. It is also an invaluable text for farmers and others who wish to understand the basic concepts of recording analysis and planning underlying present-day farm management thinking.

B.P.

books received

Farm Electrification Handbooks
No. 13. Grain Drying and Storage
No. 15. Greencrop Drying
Copies free from the Electricity Council, EDA Division, Trafalgar Buildings, 1 Charing Cross, London S.W.1.

The Costs of Fatstock Slaughtering. Report No. 9. W. J. G. Cowie and Diana J. Warren. Dept. of Agricultural Marketing, University of Newcastle-upon-Tyne, 1968. 15*s.*

Methods of Retail Beef Procurement. A Single Town Example. Report No. 10. J. H. Rennie. Dept. of Agricultural Marketing, University of Newcastle-upon-Tyne, 1968. 10*s.*

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Report of the Welsh Plant Breeding Station for 1967. Copies from the Secretary, University College of Wales, Aberystwth. 10*s.* (including postage).

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